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DEPARTMENT OF AGRICULTURE
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1960

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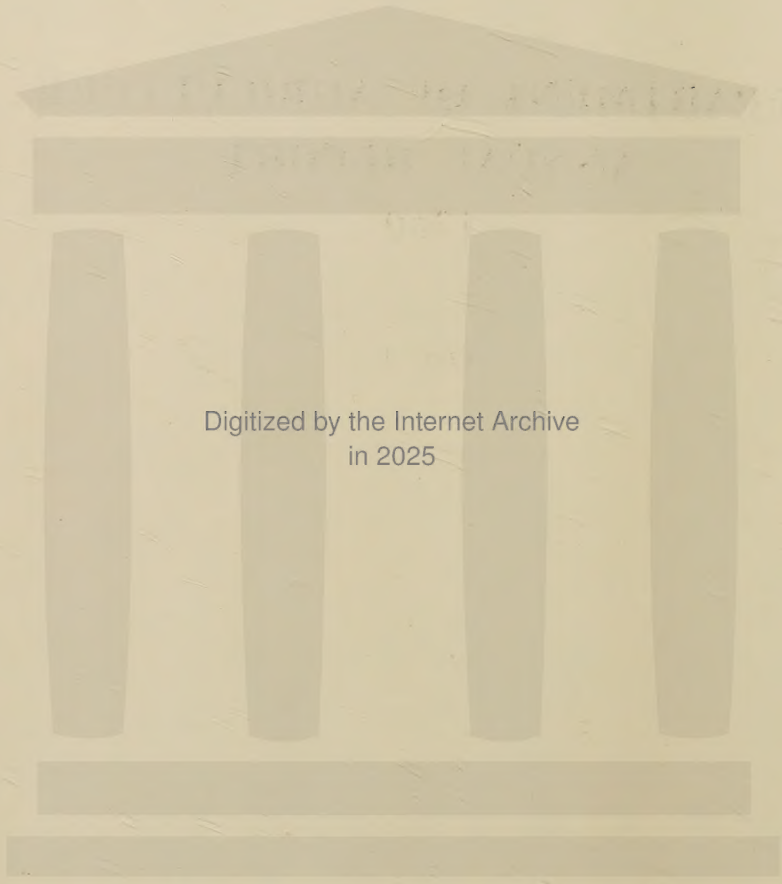

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DEPARTMENT OF AGRICULTURE ANNUAL REPORT, 1960

VOLUME I

PART I.—AGRICULTURE IN 1960

Review of the Year

In spite of the fact that 1960 was a year of badly distributed rainfall with very serious drought conditions, especially in central and eastern districts, it proved to be a very satisfactory year for production of many of Kenya's agricultural products. Coffee, sisal, tea, pyrethrum, sugar, milk, beef, mutton, wool and cashew nuts all showed substantial increases in production. On the other hand, production of wheat, maize, barley, butterfat and pig products were lower than in 1959. The total value of agricultural exports increased by £1,424,966 over the 1959 value.

Although food production in African areas has been adequate in Nyanza and the higher parts of Rift Valley and Central Provinces, famine conditions have prevailed in parts of Rift Valley, Central, Southern Provinces and Masailand, and famine relief measures have been necessary. Range grazing has suffered serious damage in some areas where the prevailing climatic conditions have augmented the effects of overstocking and losses of stock and game animals through drought, have occurred.

While developments in African areas have forged ahead and African farmers in most areas are very enthusiastic about the work the Department is doing in land consolidation, farm planning, development of cash crops, better livestock farming and general agricultural improvements, the political situation since the Lancaster House constitutional conference in February has given rise to very serious disquiet among European farmers in the Highlands. In the mixed farming areas development has virtually ceased and the main accent has been on those agricultural activities which promise a quick return on outlay. Though this trend has perhaps not been so noticeable in the plantation industries, the effects of the current political situation are also discernible in those industries. When one considers that the plantation industries and the mixed farms in the Highlands produce five-sixths of the revenue from agricultural exports which themselves constitute the major source of national wealth, the grave need for an early return to political stability and an atmosphere of confidence can readily be appreciated. Another important aspect is that these farms and estates employ large regular and casual labour forces and conditions of employment are good and steadily improving. In 1960, 224,500 people were in regular employment on farms and estates in Kenya. In addition 29,500 people were employed as casual workers, and 23,700 as squatters.

In both the African and European areas agriculture has made spectacular advances in recent years and given reasonably stable conditions, Kenya agriculture can safely be said to be set for even greater achievements. Finance to continue with development plans is urgently required and it is confidently expected that this will be forthcoming in adequate amounts if political conditions become more stable. It would be wrong to minimize the technical problems which confront us as a Department but the staff in all divisions is of high quality and these problems are being tackled with the utmost confidence. The greatest need today is the creation of an atmosphere in which all races can work together for the benefit of Kenya.

Apart from developments taking place in the African lands, the Department is co-operating with the Land Development and Settlement Board, which aims to establish peasant and yeoman farmers on holdings in the Scheduled Areas; settlement schemes are also being developed in other parts of Kenya so that intense pressure on the land in some places can be relieved, farmers in marginal areas can be given better opportunities and new horizons can be opened to good African farmers so that they can play an increasingly important part in the development of their country.

The year has seen great advances in the field of agricultural education at all levels and it is very gratifying to be able to record that the first Africans to take up appointments in the Research Division as professional officers will shortly return to Kenya after post-graduate studies overseas.

Land Management

In the Scheduled Areas, 46 farms totalling 66,736 acres were planned during the year. This constituted the backlog of orders placed in most areas and interest in farm planning generally in the Scheduled Areas has decreased due to political conditions and the present feeling of insecurity among European farmers. Although only 43 farms were planned in the preceding year, this represented an area of 114,226 acres. It is expected that the bulk of farm planning work will in the immediate future be concerned with the proposed settlement schemes in Scheduled Areas and there is thus no intention of cutting down the farm planning service at the present time.

In the Non-scheduled Areas, steady progress in land consolidation and farm layouts has continued. In Central Province, where Nyeri and Kiambu districts completed consolidation in 1959, further progress is reported in Embu, where the Divisions of Gichugu and Ndia have now been completed, while the Embu Division has been completely surveyed. In Nyanza, the principle of land consolidation has taken root and a great deal of exchange leading to consolidation is proceeding on both the clan and individual basis in North Nyanza and Central Nyanza. In Rift Valley Province, 11,000 farms were skeletally planned in Nandi District, and demarcation and enclosure have progressed well in Elgeyo and the higher parts of West Suk.

Perhaps the greatest step which has become obvious is the planting of grass leys within a sound rotation. This has accompanied the growing influx of grade exotic cattle and sheep into those areas lying above the 5,000 feet contour. Star grass and Rhodes grass have been the species most commonly used. These bold steps with exotic stock have been remarkably successful so far and the care given to these animals by African farmers, as well as their returns, have been impressive by any standards. The importance of a sound rotation using grass leys cannot be over-emphasized and the interest being shown is most encouraging. It is believed that the key to this situation is the need to introduce a better animal which will pay for the money and work which must go into the new farming system.

Shortage of staff in the field has held up progress considerably as the demand for layouts has been greater than the extension service can cope with. In some Provinces, some districts have had to be depleted of staff in order that the extension service can keep up with the demand for layouts in the more progressive districts.

Mixed Farming Livestock Enterprises

In the Scheduled Areas the area under grass leys has increased to 220,100 acres from the 1959 figure of 216,500 acres although both figures may include a certain amount of reverted pasture. There are, in addition, 2,000,000 acres of natural grassland in the ranching areas of the Highlands. Increased numbers of sheep and beef cattle can again be recorded this year although the figures for dairy cattle and pigs show significant decreases. Drought has affected the dairy industry in some areas although increased butterfat and whole milk production per animal reflect better husbandry on the part of dairy farmers including the use of leys in the mixed farming system.

	Dairy Cows	*Total Dairy Animals*	*Whole Milk* (*gallons* 1,000)	*Butterfat* (*lb.* 1,000)
1957	139,000	399,000	—	—
1958	143,000	411,000	17,147	11,066
1959	152,000	427,900	18,375	11,565
1960	148,800	412,900	18,958	11,444

The average price of butterfat rose slightly to Sh. 2/90 per pound while that of whole milk remained static.

The year remained one of high firm prices for beef and sales from the Highlands to the Kenya Meat Commission totalled 88,896 head compared with 86,392 head in the previous year. The total beef cattle numbers for slaughter from the Highlands rose slightly to 97,800 head. An increase in the total beef cattle population of the Highlands was sustained in 1960.

	Beef Cattle in Highlands (European Farms)	
	Cows	*Total*
1957	116,000	484,000
1958	121,000	506,000
1959	128,000	532,000
1960	134,700	567,300

The sheep population again increased with the accent on woolled sheep. The profits obtainable from wool and meat coupled with the fertility building potential of sheep on mixed farms and their ability to follow the dairy herd on leys, persuaded many farmers to venture into sheep for the first time. Established flocks of woolled and dual purpose sheep were increased in size.

	Sheep in the Highlands (European Farms)	
	Woolled Sheep	*Total*
1957	305,000	445,000
1958	353,000	488,000
1959	412,000	549,000
1960	457,200	582,300

The pig industry appeared to be stabilizing itself during the year but numbers of pigs on farms in the Highlands again decreased sharply. Although the price of Sh. 1/60 per pound for a triple "A" grade baconer appeared to give a reasonable margin of profit to the producer, the run-down of pig numbers continued during the year and from 70,200 in 1958, the pig population has fallen to 50,600 head in the Highlands.

The Farm Economics Survey Unit based on Njoro continued its economic surveys in four areas, i.e. Njoro, Trans Nzoia, Uasin Gishu and Molo/Mau Narok. The first-year reports on each of these areas have been published. However, the survey will continue for a period of three years in order to minimize variations caused by varying climatic and other considerations. The first-year results in Uasin Gishu and Trans Nzoia tend to vindicate the system of the more highly developed farm plus a large arable acreage, but a high level of output has been proved the necessary factor in profitability whether the enterprise be stock or crops. An interesting fact is that many farms have shown that further development would still be profitable. A Pilot Scheme has been started in Nandi and Elgeyo and work in African areas will shortly be extended.

Plantation and Cash Crop Industries

Total production for the 1959/60 coffee crop amounted to 23,394 tons and the 1960/61 crop has been estimated at 32,800 tons. Drought has adversely affected the quality of the new crop, this being the second year in succession that poor rainfall has been experienced. Plantation coffee accounts for some four-fifths of the crop, but production from African areas is rising steeply following the coming into bearing of new plantings. Throughout the whole coffee industry standards of husbandry continue to be high. In African areas the Coffee Co-operative Societies are showing

increased interest in controlling the quality of the coffee produced by their members and the better societies are beginning to inflict the severest penalties on those of their members who continually flout the rules of good husbandry or fail to give proper attention to the picking of the crop. There are hopes that the whole industry now realizes the importance of quality in its coffee crop; this is a matter of paramount importance especially since Kenya has become a signatory to the International Coffee Agreement and it is known that the class of coffee which Kenya can produce is in short supply on the world market.

The fine new coffee mills built by the Kenya Planters' Co-operative Union in Nairobi were opened by His Excellency the Governor, Sir Patrick Renison, K.C.M.G., on 25th November, so that the industry is now very well equipped to process its growing coffee crop from both quantity and quality aspects.

The production of sisal increased from 55,181 tons in 1959 to 62,600 tons in 1960, the average price being £81/12 per ton against £67/16 in the previous year. As there has been little change in acreage, this increased production reflects the widescale adoption of improved production methods and the industry is to be congratulated on a magnificent performance. Markets, both local and overseas, are constantly being explored and the Kenya Sisal Board is making every effort to keep the quality of fibre as high as possible. Famine conditions in the lower parts of Central and Southern Provinces have increased production of hedge sisal, which has proved to be a very welcome cash crop to alleviate the effects of famine.

The acreage of tea grown on estates rose by 1,000 acres to approximately 37,000 acres, while the acreage grown by African producers rose from 1,541 acres to 2,295 acres. This industry is rapidly assuming a very important place in Kenya's agricultural economy, taking third place to coffee and sisal in export value. Total Colony production rose from 27,866,845 lb. in 1959 to 30,371,154 lb. in 1960.

During the year the Special Crops Development Authority was set up to aid the establishment of tea as a crop for African farmers. The activities of this Authority are financed from Colonial Development Corporation funds to the extent of £900,000 which with additional assistance from the Kenya Government will raise the African grown tea acreage to 9,035 acres within the next three or four years.

The tea factory at Ragati is producing tea of very good quality, the average price realized for all grades being Sh. 3/91 per pound. Established estate tea factories which have been receiving leaf from African producers have commented very favourably on the quality of tea produced.

Production of dried pyrethrum flowers has risen steeply following the expansion of the market. The Pyrethrum Board is sparing no effort to expand existing markets, investigate new markets, and find new uses for pyrethrum in the whole field of insect control. In 1960, 1,035 European growers, 45 African Co-operative societies and 25 individual African farmers were producing pyrethrum under licence. Interest in pyrethrum production by African farmers, after an initial period when they failed to take up the quota allocated to them, has more recently increased to such a marked degree that, although quotas much higher than those planned have been allocated to them, there is grave danger of over-production in South Nyanza, Kiambu and Elgeyo. This situation is currently giving rise to considerable concern as it is proving difficult to bring home to the African farmer that production must be kept in line with the ability of the Pyrethrum Board to sell the crop, which, as figures given elsewhere in this report will show, is doing an excellent job in expanding production. Pyrethrum has proved to be a very popular cash crop with African farmers and fulfils a long-felt want for a cash crop for high areas with conditions not suitable for coffee or tea.

Production of sugar from Miwani (Nyanza) and Ramisi (Coast) has increased in total, although that from Ramisi has fallen slightly compared with 1959. Expressed in long tons, production from Miwani totalled 21,852 for the year and from Ramisi 8,026. This compares with 19,015 and 8,195 respectively for 1959.

Other cash crops produced by non-African growers, such as wattle and pineapples, are of importance locally; the wattle industry has had to meet difficult marketing conditions with a slight rise in production, while pineapples increased in importance with 5,186 tons being sold ex European farms to the canneries. Sales of pineapples from African farmers in Central Province fell again but this crop received an impetus during 1960 by a loan to African growers, mainly for fertilizer. There was also the promise of sympathetic consideration by the Board of Agriculture (Scheduled Areas) of applications for loans for this purpose by European growers.

At the Coast, cashew nuts are growing in importance. They yield, when in full bearing, a cash return of £90 an acre, which is comparable with that of tea and coffee. Production rose to 6,000 tons of nuts in the current season and this is expected to realize some £235,000 for the growers.

Similarly, coconuts assume a greater importance and have produced £240,000 to the producer. The effects on yield as a result of the Coconut Improvement Scheme, will not be discernible for several years yet but selected seedlings continue to be issued at the rate of 100,000 per year from Department nurseries.

Agricultural Education

Agricultural education grew greatly in scope and popularity during 1960 and this activity is beginning to assume its rightful place as an integral part of rural progress. The expansion of Siriba College to embrace a diploma course in agriculture proceeded satisfactorily and new buildings were erected with financial aid from the Rockefeller Foundation and the Hindocha Trust. Student entry was finalized and arrangements for teaching staff were satisfactorily completed such that the first course will start in January, 1961. The status of the student entry has been raised, and only school certificate students are now considered for training at certificate and diploma level.

The Farmers' Training Centres continued to expand in numbers and popularity. In Nyanza Province the Bukura Centre was in operation for a full year while centres at Kabianga and Kisii opened during the year.

American aid administered through I.C.A. enabled not only senior officers of the Department to complete training tours in the United States of America, but also enabled junior staff to proceed to the States in order to read for degree courses at American Universities and to gain experience in extension methods.

Irrigation

The Mwea Irrigation Settlement has been further enlarged. Nine hundred and thirty-five acres at Nguka were completed by the Ministry of Works and settlers have now harvested crops from that part of it which was completed first, the crops on the remainder are in various stages approaching harvest. The average income per settler was, after deducting all costs exclusive of the tenants' own labour:—

Tebere	£122/10.
Nguka	£149/17.
Average	£130/6.

The average yield rose to 23·1 bags of paddy per acre on Tebere and 27·35 bags per acre on Nguka with an average of 24·31 bags per acre over the whole scheme. This is very satisfactory progress and the Manager is to be congratulated on his organization of the planting and harvesting.

At Pekerra the Njemps and Tugen settlers have shown themselves deeply suspicious of every innovation, partly as a result of the fiasco over tomatoes in 1956. When onions were introduced as a cash crop in the long rains, only eight farmers planted any appreciable acreage. Only when they had obtained an average yield of 4·48 tons per acre, worth £150 and the crop was proved to be profitable, did other farmers show any enthusiasm. Since then 80 per cent of the settlers are growing the short rains onion crop. When the possibility of closing the scheme was put to the settlers, a revival of interest was aroused and co-operation has improved considerably.

At Galole, the financial stringencies and the withdrawal of prisoners and restricted persons have tended to reduce activities on the scheme. On the other hand, the move of the District Headquarters to Galole and the building of a new hospital there have had the opposite effect, and the Pokomo themselves have expressed a desire to settle on the scheme. The farmers remaining on the scheme have shown a better appreciation of the water requirements of various crops. This is reflected in an average cotton crop of 1,200 lb. per acre, with some individuals obtaining up to 2,000 lb.

The establishment of the Kano Irrigation Research Station was completed and much progress in the final development of the layout, the pumping installations and buildings was made by the officer in charge. Investigations on sugar cane, rice and cotton, together with minor vegetable crops, particularly Indian vegetables was continued and expanded.

Research

Following further financial cuts in funds allocated to research activities a comprehensive review of the whole field of work is being undertaken to ensure that available funds are channelled into projects likely to lead to increased agricultural production or the alleviation of recurrent food shortages in the more marginal areas of the country and a better standard of nutrition for the people generally.

Certain industries have continued to spend their own money in financing research and with these the drive to get new information required to improve production has suffered no setback and has in fact increased in some cases. The coffee, sisal, pyrethrum, cereals and cotton industries are notable cases in point. Generous financial assistance for research has again been received from the Colonial Development and Welfare Fund, the Rockefeller Foundation and the International Co-operation Administration of the United States of America.

The research advisory committees have continued to play an important part in effecting liaison between producers and research officers; allocating priorities to projects and assisting greatly in organizing the steady flow of extension information to growers. Progress with research is reported in Part II of this Volume but fuller reports on research matters will be published in due course in Volume II, Record of Investigations. Increasing attention is being given to the important matter of getting the results over to growers and Departmental field officers so that they can be adopted in the field. Various methods are used, e.g. farm visits, broadcasts in English and vernacular languages, posters, publications in the farming press, courses at Farmers' Training Centres and organized group visits to farms and research stations. There is still a need for greater effort in these directions but the effectiveness of the extension effort is gaining ground as reference to the list of publications issued during the year (printed in Part IV of this report) will show.

The research division continues to give considerable emphasis to the evaluation of potential new crops for Kenya and the elimination of difficulties which have prevented the full development of certain other crops in the past. In the former category good progress is being made with dates, the trial of various *Dioscorea* spp. as a source of diosgenin, certain drug plants, soft fibres, etc., while in the latter category promising results are being obtained from new work with bean varieties, geranium oil, safflower, soya beans, lemons, etc. On the livestock side, an interesting investigation on the management of grade Jersey cattle under improved farming conditions at the Coast is being conducted at the experimental station at Mtwapa and this is creating a great deal of interest. Valuable studies on the feeding of dairy cattle continue at Kitale. Considerable interest is also being shown in the comparison of pure Corriedale versus Corriedale × Hampshire and Corriedale × Border Leicester sheep at Ol Joro Orok and Karakul versus Dorper versus Persian Blackhead sheep in the dry country at Katumani, Machakos.

The Soil Science section of the Department at the Scott Agricultural Laboratories is receiving valuable assistance from Dr. D. D. Evans, a Soil Physicist working under I.C.A. Further, the return of Dr. A. Mehlich, I.C.A. Soil Chemist, for another tour of duty has been greatly welcomed. Dr. H. A. Bees, Professor of Entomology at the University of Hawaii has been engaged under a Fulbright Grant on a study of the Interaction between Biological and Chemical Control of Pests of the Coffee Crop. Dr. V. L. Bunderson, a grassland and animal husbandry specialist under I.C.A. is investigating problems of Range Management and Grassland Improvement in Coast Province.

The Research Division continues to receive valuable co-operation from the East African Agriculture and Forest Research Organization and the East African Veterinary the Tea Research Institute at Kericho, the Pyrethrum Research Laboratories at Nakuru, the Chief Chemist with Messrs. Unga Limited, the East African Industrial Research Organization and our opposite numbers in the Agricultural Departments in Uganda and Tanganyika. From overseas, technical assistance comes to us from the Colonial Office, the Tropical Products Institute and the Consultant Directors and Directors of the various bureaux and institutes under the Commonwealth Agricultural Bureau Organization.

The Rainfall of Kenya, 1960

The general distribution of rainfall in Kenya during 1960 shows three large-scale departures from normal. During the second half of March extremely violent and widespread storms were experienced over north-eastern districts, the area affected included the northern half of the Coast Province and eastern parts of Northern Province, roads and bridges were washed away by floods and other damage was reported from Garissa. Two serious droughts provided the other headlines: one in the Rift Valley, centred on the Gilgil–Naivasha area, persisted for four months from April to July and caused considerable losses in crops and stock; the other affected the plains of Central and Southern Provinces and much of the Coast Province during November and December, destroying many "short rains" crops. Both of the droughts were preceded by above-average rainfall in March and October in the respective areas.

During January, February and the first half of March, thundery showers in Nyanza Province and on high ground west of the Rift Valley were rather more frequent than normal, but dry conditions prevailed in all other areas. Widespread heavy rain commenced in most places on 14th March and continued, with short breaks, until the end of the month, north-eastern districts recording extremely high totals. Well distributed rainfall continued through April and May in Nyanza Province, but large deficits were recorded in the Rift Valley, Central and Southern Provinces.

During June and July the lack of rainfall became serious in the Rift Valley and totals were below average in most other inland areas. On the coast, however, rainfall during this wet season was generally above average, especially during June when some high totals were recorded.

During August and September most of the Rift Valley Province received above-average rainfall, Nyanza was generally above average while the plains in the east and south and most of the Coast Province were even drier than is normal at this season.

Widespread storms occurred over all areas east of the Rift Valley during the last nine days of October, bringing totals for that month to well above average. Unfortunately, this tendency was not maintained, showers became very scattered during November and December and the rainfall deficit became serious over the plains of Central, Southern and Coast Provinces. Scattered showers and storms produced approximately average rainfall totals in Nyanza and Rift Valley Provinces during the last quarter on 1960, but after about 22nd December dry, sunny conditions prevailed over the whole of Kenya.

TABLE A.—SOME FIGURES OF RAINFALL IN THE AGRICULTURAL AREAS OF KENYA, 1960

Name of Station		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year's Total
Kilifi Kibirani ..	Total	0·00	0·10	3·62	4·40	8·17	7·00	3·61	1·35	0·85	4·61	1·23	0·74	35·68
	%	0	45	209	79	74	157	103	52	35	147	44	31	88
Ruiru Jacaranda ..	Total	0·75	0·46	9·72	10·05	1·75	0·31	0·64	0·29	0·68	3·23	7·66	1·23	36·77
	%	41	29	300	108	25	15	65	26	47	133	151	40	94
Bukura Farm. Inst.	Total	5·83	7·95	12·66	8·54	7·38	2·81	3·98	4·21	5·89	4·29	6·24	3·57	73·35
	%	312	248	220	88	75	46	72	57	95	91	149	97	108
Kitale, O. H. Knight	Total	1·09	1·75	6·85	2·56	3·37	2·16	4·54	1·90	3·20	2·61	1·17	0·80	32·00
	%	133	168	303	46	59	81	80	32	99	89	54	93	79
Thomson's Falls, K.C.C. Ltd. ..	Total	2·17	0·18	2·30	4·10	4·03	1·81	3·86	7·95	2·95	1·10	2·32	1·54	34·31
	%	185	13	116	96	111	50	69	129	112	84	87	64	93
Nyeri Mweiga Estate	Total	2·40	0·83	2·50	5·78	1·85	1·00	0·27	0·35	0·00	3·90	3·06	3·37	25·31
	%	112	53	90	100	40	80	17	22	0	150	77	96	78
Njoro Plant Breeding Station ..	Total	0·39	0·69	4·57	2·64	4·53	0·67	1·21	8·94	3·71	2·34	1·74	1·00	32·43
	%	37	51	170	52	07	20	27	187	188	119	66	55	89
Naivasha Expt. Stn.	Total	1·42	0·76	2·87	3·35	0·93	1·02	0·17	1·86	2 20	2·91	3·81	1·09	22·39
	%	113	61	133	72	23	46	9	92	113	143	150	73	82
Kapsabet District Office	Total	1·47	0·71	11·13	10·55	5·07	5·24	4·13	10·52	10·75	1·79	3·90	2·74	68·00
	%	73	25	249	138	60	83	63	133	186	51	132	129	112
Molo Murimani ..	Total	1·46	1·50	5·35	7·54	3·58	1·77	2·40	8·90	3·59	1·66	2·83	0·83	41·46
	%	124	106	211	104	64	40	42	152	117	78	104	36	94
Lumbwa Mtwarogon	Total	2·80	0·65	11·68	7·61	4·97	1·97	2·54	5·19	5·48	0·55	2·21	3·15	47·90
	%	200	27	333	112	75	22	52	98	156	24	108	183	107

Food Production in African Areas

Although heavy long rains were experienced in Nyanza, the rest of Kenya was generally short of rain. This was accentuated by poor short rains throughout the country. The result has been that although food crops in Nyanza and the higher parts of Rift Valley Province and Central Province have been adequate, famine conditions are prevalent throughout the lower areas of Rift Valley, Central and Southern Provinces. At the Coast the rains were poor, and although maize has had to be imported, no famine conditions have been experienced on account of the high priced cash crops.

Agricultural Exports

The total value of agricultural exports increased from £29,648,472 in 1959 to £31,073,438 in 1960.

Exports of the following commodities exceeded £500,000.

	Position in 1959	1959 £	1960 £
1. Coffee	1	10,593,790	10,194,898
2. Sisal	3	3,458,472	4,566,033
3. Tea	2	3,601,643	4,410,922
4. Pyrethrum (including Extract)	4	2,196,268	3,025,269
5. Meat and Meat Products	8	1,044,998	1,845,175
6. Hides and Skins ..	5	1,608,930	1,755,745
7. Wattle Bark and Extract	6	1,224,086	962,709
8. Cotton	10	658,264	841,827
9. Butter..	8	710,610	650,519

Crops

Cashew Nuts.—Following the very good prices paid to growers in the 1959/1960 season, when the average was 45 cents per pound, with prices of over 50 cents per pound in some areas, the new planting during the year is estimated at 8,000 acres. The price paid in the 1960/1961 season, which opened in November in Malindi and Kilifi districts, dropped to the fixed minimum price of 35 cents per pound. The main reason for this was that the buyers in India formed a ring and kept the price down. The total crop in 1959/1960 season was 4,966 tons and the cash return to the growers totalled £192,998. In the 1960/1961 season the 2,500 tons had been sold by the end of the year and the total crop is expected to be in the region of 6,000 tons. Seven exporters were licensed in the 1959/1960 season and six in the 1960/1961 season. Two processing licences were issued.

Cassava.—This crop is mainly grown at the Coast where the introduction of the variety of 46106/27 which is resistant to mosaic gives good yields and is palatable, has increased the acreage grown. It is becoming more popular in Southern Province and the West Suk and Baringo districts of Rift Valley Province where it is encouraged as an insurance against famine.

Castor Seed.—Despite the dry weather, Kitui and Machakos districts increased their harvests. The value of the Kitui crop rose to £41,454. At the Coast, however, despite the introduction of improved varieties, little interest is shown and the old self-sown varieties are preferred.

Cereals.—Crops (Scheduled, section 109, Agriculture Ordinance, 1955) Production Estimates for the 1960 crops from the Scheduled Areas are:—

	Acreage	*Average Yield Bags/Acre*	*Total Yield Bags*
Wheat	244,539	5·75	1,407,206
Maize (white)	121,746	7·54	918,338
Maize (yellow)	11,942	6·34	75,774
Barley	25,994	7·50	195,110
Oats	19,287	7·45	143,834
Sunflower	10,736	6·05	64,980

For comparison, the actual production figures for 1959 crops were:—

Wheat	255,856	5·54	1,418,502
Maize	115,222	9·28	1,070,351
Barley	38,776	7·29	298,195
Oats	19,020	7·70	146,546
Sunflower	9,755	5·64	55,102

The following amounts of maize were bought by the Maize Marketing Board:—

		Bags 200 lb. net
(*a*) Scheduled Areas		865,936
(*b*) Non-scheduled Areas:		
Nyanza Province	768,433	
Central Province	50,950	
Rift Valley Province	40,915	
Southern Province	106	
Coast Province	—	
Forest Areas	33,599	
		894,003
		1,759,939

Approximate value: £3,310,445.

Guaranteed prices for these crops were:—

		1959 *Sh. cts.*	1960 *Sh. cts.*
Maize	200 lb. net in bag	37 90	35 50
Wheat	200 lb. net in bag	50 00	50 00
Barley	180 lb. net in bag	20 00	20 00
Oats	150 lb. net in bag	15 00	Unscheduled
Sunflower	100 lb. net in bag	13 50	Unscheduled

Cereals (Other).—Production remained about level in all provinces except Southern Province where the dry conditions have induced farmers to abandon maize in favour of millets and sorghums.

Chillies.—The production of chillies at the Coast declined due to the low prices paid for the 1959/1960 crop. The price has now risen to £200 per ton for Grade I chillies and interest in the crop has revived. A total of 145 tons worth £10,745 was exported.

Coffee.—Total Colony production for the 1959/1960 crop amounted to 23,394 tons compared with the previous crop of 23,355 tons. This comparatively small increase was due to the dry season. The crop was valued at £9,096,692 with an average payout of Sh. 388/84 per cwt. The area planted to European coffee rose to 69,567 acres and the particulars of African grown coffee are given in Table B. Although production did not increase markedly the quality was raised considerably. This is reflected in the average price of Sh. 388·84 which is a drop of only Sh. 9 per cwt., although the average price in any one grade has dropped considerably more.

TABLE B.—PARTICULARS OF AFRICAN-GROWN COFFEE AS AT 31-12-60

District	Total Planted Acreage	Production in 1960		Value to Grower	No. of Growers	No. of Nurseries	No. of Seedlings in Nurseries	No. of Factories	No. of Co-op. Societies
		Tons		£					
		Clean	*Mbuni*						
ARABICA—									
South Nyanza	4,938	621	751	361,050	19,500	31	494,000	24	33
Elgon Nyanza	2,573	282	110	101,588	10,049	18	632,000	13	13
North Nyanza	412	19	27	11,229	1,896	5	45,900	2	8
Central Nyanza	60	1	—	166	266	3	95,000	—	2
Kericho	96	—	6	480	305	3	50,000	—	1
Taita Hills	552	69	—	15,150	2,400	1	180,000	2	1
Machakos	1,190	158	40	58,803	8,129	15	800,000	3	7
Meru	8,766	1,604	170	747,127	28,986	42	1,275,518	53	19
Embu	5,507	1,446	126	537,557	14,818	28	1,200,000	24	11
Nyeri	3,021	293	80	114,733	7,726	16	457,000	12	4
Fort Hall	2,436	362	96	179,151	6,226	33	1,023,000	15	11
Kiambu	3,197	199	9	83,541	4,187	32	1,093,000	11	8
Baringo	26	—	—	—	145	2	43,000	—	—
Nandi	93	½	⅓	150	463	6	35,000	1	—
West Suk	63	—	—	—	310	1	37,000	—	—
	32,940	5,054½	1,415⅓	2,210,725	105,406	239	7,460,418	160	118
ROBUSTA—									
Elgon Nyanza	88	3	—	289	424	2	13,000	—	2
North Nyanza	34	3	—	289	320	1	13,000	—	1
Central Nyanza	75	—	—	—	150	3	—	—	4
	197	6	—	578	894	6	26,000	—	7
TOTAL COFFEE	33,137	5,060½	1,415⅓	2,211,303	106,300	245	7,486,418	160	125

Considerable progress in the use of sprays and fertilizers is recorded from Central Province. Some of the Co-operative Societies have tended to ignore the advice given to them due to the political situation and the desire to run their own affairs, but in other societies there has been a welcome increase in their appreciation for the need of discipline. In some cases the societies have exerted their authority very strongly, even to the extent of ordering the up-rooting of badly maintained trees.

Coconuts.—The coconut improvement scheme continued to operate and a further 100,000 selected seedling coconuts were distributed. The quality of copra produced at the Coast is low and the consequent low price has acted to discourage its production. Tests are being carried out with an improved type of drier in an effort to increase the production of copra. Sales of Palm Toddy as usual flourish.

Cotton.—The Coast cotton crop in the 1959/1960 season was so successful that the Giriama farmers at the Coast have been celebrating ever since. The result was poorly prepared land, very late planting and the minimum of attention. Production at Malindi is only expected to total one-third of the last season's production. In contrast, in the Taveta area increased yields have resulted from early planting and an increased crop from Kwale district is expected. This is from a larger area and not from increased yields.

In Nyanza the 1958/1959 crop was depressed by dry weather, but the crop which is at present being harvested is expected to rise to 14,000 bales. The acreage increased and a large-scale spraying programme on early planted cotton, showed promising results. The early planting campaign achieved only a measure of success and greater progress in this respect is desirable. In order to boost the extension work on cotton the Cotton Board has now employed additional field staff in Nyanza. Particulars of the 1959/1960 crop are given below:—

		Bales of Lint of 400 lb.			
	Acres	*A.R.*	*B.R.*	*Total*
Nyanza Province ..	55,500	10,571	1,151	11,722
Coast Province ..	39,800	6,201	1,251	7,452
	95,300	16,772	2,402	19,174

The prices paid to growers were 47 cents per pound for "A" Grade and 18 cents per pound for "B" Grade in both the Coast and Nyanza. The 1960/1961 crops is estimated to be 15,755 bales with 12,631 coming from Nyanza and 3,124 from the Coast. The buying season opened first in the Lamu/Tana River area in the middle of October, but the rest of the Coast opened on the 23rd of November and Nyanza did not open its season until the 5th of December. Prices paid to growers this season are:—

	"A" Grade cents	*"B" Grade cents*
Coast Province	55	20
Lamu/Tana River/Galole	52	20
Nyanza Province	54	20

Essential Oils.—The acreage of geranium in North Lumbwa rose slightly despite the difficulties of establishment caused, it is thought, by plant pathogens. The yields of green material were high and the oil content satisfactory.

Groundnuts.—Throughout Nyanza Province there has been a revival of interest in groundnuts except in Elgon Nyanza where its labour requirements make it unpopular. The dry weather in the middle of the year spoilt the prospects of a record yield, but amounts sold are definitely higher. The total surplus to be sold is estimated at 25,000 bags. The introduction of the crop in the lower Kipsigis areas was particularly successful.

Kapok.—Kapok is disappearing as a cash crop and giving way to cashew nuts. Production was valued at £1,578.

Maize.—*See* crops—Scheduled.

Passion Fruit.—Interest in Passion Fruit has revived and there has been a marked increase in production at Sotik and Kisii. European farmers in Sotik are awaiting results of departmental experiments before increasing their acreages. The marketing of the product is causing some anxiety. 4,130 gallons of passion fruit juice worth £1,626 were produced. In Machakos a further 40 acres were planted and nurseries for a similar area to be planted in 1961 were prepared. In Elgon Nyanza and in Kericho several African farmers are planting up small areas to the crop.

Pineapples.—The closure of the cannery for a brief period several years ago has made the African farmer in Central Province very loth to expand his acreage of pineapples or to restart their cultivation. The cannery sought Government support and as a result £7,500 of loan money was set aside for the purchase of suckers and fertilizers. The acreage by the end of the year in African areas was 6,594 and production 6,253 tons. This represents a very slight increase on the 1959 production of 6,212 tons. In Kiambu and Fort Hall the area in which pineapples are grown is spreading to altitudes above the optimum for quality and this trend is likely to continue so long as the canneries continue to accept fruit from these areas. The total European production was 5,186 tons.

Potatoes.—The main crop of potatoes in Central Province yielded well, but the short rain crop was ruined by drought. In Rift Valley Province the European area grew 2,300 acres but the acreage in Elgeyo declined in favour of the greater profitability of pyrethrum. The total acreage in Rift Valley African areas remained at approximately 1,085 acres. The total production from African areas rose to 11,693 bags valued at £124,581.

Pulses.—Recorded sales in Provinces are given in Table D and exports in Table C.

Pyrethrum.—Production of dried flowers almost doubled the 1959 total of 4,846·5 tons and totalled 8,522·3 tons. The Board also bought 90·5 tons from Tanganyika. The licensed area rose to 43,456 acres of which 38·781 acres were European owned and 4,675 acres were African owned. This latter figure only represents the licensed individual growers and the total African area of pyrethrum is estimated at 13,439 acres which produced 1,943 tons of dried flowers.

The total number of growers was:—

European	1,035
African Individuals ..	25
African Co-ops.	45

Rice.—In Nyanza Province the production rose again in South and Elgon Nyanza districts. In South Nyanza the production more than tripled that of the previous crop year and rose to 15,000 bags. In Central Nyanza the water control has been handed over to the farmers with the result that the irrigation channels have become weed choked. Rice co-operatives have been formed and it is hoped that they will attempt a better supervision of water control and channel maintenance. The change-over from Shingo-le-Majani to the more commercially acceptable Sindano variety is almost complete. Total production in Nyanza was 40,000 bags.

In Central Province, the Mwea Irrigation Scheme increased its acreage to 3,281 acres, its average yield per acre to 24·31 bags and its total production to 79,760 bags (5,697 tons).

Sisal.—Production in 1960 rose by 7,000 tons to a total of 62,619 and the price rose from an average in 1959/1960 crop year of £67·79 per ton to £81·60 per ton in the 1960/1961 crop year up to December, 1960. The African crop from Machakos district rose in value to £236,760.

At the end of the year production from the scheme had risen to 600 tons per month, though this was not regularly achieved due to labour difficulties.

Sugar.—Kenya factories produced a total of 29,608 long tons of sugar of which Miwani produced 21,582 tons and Ramisi 8,026 tons, an increase of 8·8 per cent on the previous year's production. The Miwani Mills crushed 220,387 tons of cane of which 77,353 tons were supplied by members of the Nyanza Farmers' Co-operative Union. The price paid to smallholders for cane delivered at the factory rose to Sh. 47 per ton. The production of jaggery is estimated at 3,000 tons.

The standard of cultivation in the Miwani/Kibos area is improving and the number of growers is rising. Weather conditions were on the whole more favourable. The short rains provided excellent planting weather, but this was followed by a very hot dry spell which inflicted considerable damage. This was added to by the activities of fire-raisers who have set fire to considerable areas. Sugar cane smut incidence is increasing. The Nyanza Farmers' Co-operative Society continued to press for a monopoly in jaggery which the Commissioner for Co-operative Development has granted and it is hoped that this will lead to a better control of marketing.

Considerable European interest is developing in the Songhor region and ways and means of raising a second factory are being sought. Miwani has now opened a methylated spirits distillery.

Tea.—The area licensed for the planting of tea rose to 73,381·8 acres and that planted rose to 37,000 acres. In the African areas the total acreage rose to 2,295 acres, an increase of 750 acres.

Production in 1960 rose to 30,371,154 lb. of made tea. This is an increase of 2,504,209 lb. and Kericho district produced 22,401,376 lb., by far the major part of the crop. The Ragati Tea Factory increased its production from 182,108 lb. in 1959 to 328,486 lb. in 1960. In Central Province the total acreage was increased from 1,217 to 1,683 acres.

Production averaged only 195 pounds of made tea per acre which was largely due to the dry weather. The number of growers in Central Province is now 5,028. In Nyanza the total acreage rose to 525 and the number of growers to 1,475.

Tobacco.—Tobacco cultivation on a commercial basis was centred in Embu, Fort Hall and Kitui but tobacco for snuff and local consumption was grown in fair quantities at the Coast. The East African Tobacco Company have supplied the following figures:—

Area	*Leaf Purchased (lb.)*		*Value*
	Green	*Cured*	£
Kitui	178,265	33,180	2,900
Ena	510,432	—	2,140
Sagana	879,366	—	3,649
	1,568,063	33,180	8,689

Prices paid per pound of green leaf were:—

	cents
Grade I	12
Grade II	8
Grade III	3

and for cured leaf:

	Sh.
Grade "A"	5/10
Grade "B"	4/85
Grade "C"	4/10
Grade "D"	3/35
Grade "E"	2/85
Grade "F"	1/45
Grade "H"	1/00
Scraps	0/60

The acreage remained very much the same as in previous years and the greatly reduced output was due entirely to the adverse weather conditions. Trials of Turkish Tobacco in the field gave promising yields, but the intricacies of curing were not mastered and the products only obtained very low prices on the Rhodesian market.

Vegetables, Fruit and Flowers.—Particulars of sales from African areas, which produce the bulk of these items, are given in Table D. The quantities of fruit and vegetables imported during the year are given at Table E.

The development of market gardens, particularly in Central Province, continues to serve an ever-expanding local market. The recorded value of exports, which is only a part of what was actually sold, is as follows:—

	Value £
Bananas—	
2,840 tons	23,875
Flowers, fruit and vegetables—	
11,368 tons	200,711
Miraa (*Catha edulis*)—	
283,584 bundles	77,985
Onions—	
157 tons	4,966
Total .. £	307,537

In Southern Province the horticultural income was:—

	Value £
Fruit and Vegetables (incl. Mangoes)—	
1,080 tons	52,288
Onions—	
9 tons	225
£	52,513

This considerable reduction is the result of drought.

In Coast Province the development of the mango export trade continued. In Taita district the sale of vegetables to Mombasa is now well established to an expanding degree. The whole value of bananas, fruit and vegetables to the Province was £91,953.

Wattle.—Production of wattle bark remained at very much the same level as in 1959 with a further slight decrease in value:—

Central Province—1,260 tons, worth £176,000.

Export figures are given in Table C.

Wheat.—*See* crops—Scheduled.

Livestock Products.—Particulars of production from African areas are given in Table D and exports are shown in Table C (attached).

TABLE C.—QUANTITIES AND VALUES OF EXPORTS OF KENYA PRODUCTS, 1960

Commodities	Unit	Quantities					Values				
		1939	1957	1958	1959	1960	1939	1957	1958	1959	1960
							£	£	£	£	£
Livestock Products											
Beeswax	Cwt.	1,208	827	1,576	1,521	870	5,162	20,329	36,872	33,321	18,650
Butter/Ghee	,,	21,277	31,080	65,716	51,140	49,354	90,659	506,959	972,549	710,610	734,512
Cattle	No.	—	395	260	1,363	1,555	—	12,550	7,587	33,075	3,832
Cheese	Cwt.	652	758	749	6,858	3,240	2,987	11,500	10,675	82,344	42,472
Hides and Skins	,,	—	112,730	85,760	107,995	131,301	155,868	1,462,861	1,017,799	1,608,930	1,734,395
Meat—											
Bacon and Ham	,,	1,376	11,767	38,911	38,237	22,806	9,080	172,069	406,346	380,965	240,907
Beef and Veal	,,	—	—	—	63,454	54,393	—	—	—	482,919	447,835
Mutton	,,	—	—	—	1,513	2,158	—	—	—	14,135	19,260
Pork	,,	—	—	—	524	908	—	—	—	7,790	13,087
Tinned	,,	—	—	—	59,803	54,790	—	—	—	1,044,998	892,420
Sheep and Goats	No.	—	284	280	2,813	422	—	621	831	7,612	1,157
Wool	100 lb.	15,114	16,210	16,665	20,025	21,235	56,578	289,677	309,253	380,988	377,410
Other Livestock Products	—	—	—	—	—	—	—	—	—	82,118	345,676
Crop Produce											
Cashew Nuts	Tons	32	1,714	1,745	1,911	4,809	1,812	114,898	108,792	100,659	323,263
Castor Seed	Tons	—	4,325	6,932	3,946	3,310	—	271,733	311,894	177,660	179,500
Coconuts and Copra	Tons	215	102	542	1,727	1,033	1,561	2,259	19,808	117,568	62,625
Coconut Oil	Cwt.	33,152	208	1,129	530	902	2,346	1,177	6,038	3,917	5,366
Coffee	,,	338,125	445,677	500,536	517,545	556,476	800,827	10,812,281	10,422,722	10,593,790	10,277,852
Cotton	100 lb.	59,677	31,097	49,294	70,567	77,998	124,021	369,722	514,846	658,264	841,827
Essential Oils	Cwt.	*gal.* 3,660	1,051	717	516	1,299	4,956	32,687	20,107	19,369	40,814
Grain, other than Maize and Wheat	,,	14,618	691	849	27,419	28,793	4,424	1,750	1,999	27,864	36,395
Groundnuts	Tons	402	2,039	1,427	2,041	1,862	4,442	146,172	95,414	119,297	138,276
Groundnut Oil	Cwt.	6,233	16	6	1	—	680	120	34	11	3
Maize	,,	1,007,125	452,177	1,956,644	1,086,300	184,027	222,327	466,062	1,867,061	1,092,144	178,418
Maize Meal and Flour	,,	122,029	368	11,248	25,380	15,905	25,450	714	22,263	31,126	17,196
Passion Fruit Juice	,,	22,744	*gal.* 4,088	*gal.* 3,240	*gal.* 2,062	*gal.* 2,960	6,713	3,253	2,156	1,609	2,556
Pineapples (tinned)	100 lb.	—	115,355	155,322	109,748	94,494	—	584,358	555,351	490,719	443,185
Potatoes	Cwt.	173,046	31,454	43,636	38,836	52,078	29,199	37,420	51,989	38,620	52,297
Pulses (including Beans and Peas)	,,	130,758	8,635	63,592	156,553	138,463	42,952	23,590	129,384	321,154	274,792
Pyrethrum	,,	55,628	34,636	36,125	20,950	62,664	357,170	506,154	524,766	333,272	1,006,154
Pyrethrum Extract	,,	—	1,537	3,435	4,058	5,202	—	597,300	1,289,319	1,862,996	2,019,115

TABLE C.—QUANTITIES AND VALUES OF EXPORTS OF KENYA PRODUCTS, 1960—(*Contd.*)

Commodities	Unit	Quantities					Values				
		1939	1957	1958	1959	1960	1939	1957	1958	1959	1960
							£	£	£	£	£
Sesame Oil	Cwt.	89,944	171	412	17,173	31	10,008	1,249	2,673	52,805	215
Sisal	Tons	29,163	39,598	42,147	51,005	57,043	442,434	2,078,012	2,227,997	3,458,472	4,566,033
Sugar	Cwt.	81,463	791	350	680	258	50,308	2,538	1,160	1,747	762
Sunflower Seed	Tons	477	1,283	1,550	2,873	1,999	3,997	53,759	52,046	82,851	66,046
Tea	Cwt.	88,627	143,878	162,723	188,461	214,209	501,732	2,860,612	3,216,977	3,601,643	4,410,922
Wattle Bark	,,	226,716	83,992	59,020	123,848	145,241	72,846	134,452	94,615	197,833	232,760
Wattle Extract	Tons	131,312	826,296	379,646	388,786	14,253	91,439	1,521,875	1,024,166	1,026,252	729,949
Wheat Flour	Cwt.	63,883	1,668	2,580	1,251	9,972	50,655	4,705	8,531	3,887	27,954
Other Agricultural Produce ..	—	—	—	—	—	—	55,649	340,830	986,544	363,858	9,643,565
						Total .. ..£	3,242,495	23,446,278	26,320,584	29,648,472	31,073,438

TABLE D.—QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED FROM THE AFRICAN AREAS (PARTLY ESTIMATED), EXCLUDING NORTHERN PROVINCE AND MASAI DISTRICT

Produce	Unit	Nyanza Province		Rift Valley Province		Central Province		Southern Province		Coast Province		Total	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
			£		£		£		£		£		£
Bananas	Tons	942	10,556	—	—	2,840	23,875	—	—	10,400	41,892	14,182	76,323
Cashew Nuts	125" lb.	—	—	—	—	—	—	—	—	4,966	192,998	4,966	192,998
Cassava	Tons	37,237	18,619	—	—	—	—	—	—	14,240	8,300	51,477	26,919
Chillies	Tons	—	—	1	60	—	—	—	—	144	10,694	145	10,754
Coffee (Parchment and Buni)	Tons	1,820	479,314	3	300	4,871	1,855,194	198	58,803	69	15,150	6,961	2,408,761
Copra	Tons	—	—	—	—	—	—	—	—	1,784	36,802	1,784	36,802
Coconuts	No.	—	—	—	—	—	—	—	—	2,382,660	143,556	2,382,660	143,556
Coir	Tons	—	—	—	—	—	—	—	—	1,070	28,950	1,070	28,950
Coriander	90 lb.	—	—	—	—	—	—	177	597	—	—	177	597
Castor Seed	180 lb.	1,088	2,480	—	—	2,625	6,800	14,273	44,908	15,449	80,093	33,435	134,281
Cotton Lint	400 lb.	19,417	346,434	—	—	—	—	—	—	4,712	144,850	24,129	491,284
Charcoal, Fuel, Poles	—	—	—	—	—	—	81,878	—	1,700	—	—	—	83,578
Groundnuts	180 lb.	12,641	44,953	—	—	—	—	—	—	—	—	12,641	44,953
Kapok	lb.	—	—	—	—	—	—	—	—	47,040	1,578	47,040	1,578
Maize and Maize Meal	200 lb.	673,051	797,166	42,734	76,921	49,248	73,000	3,552	7,726	3,134	5,642	771,719	960,455
Millets and Sorghum	200 lb.	—	—	—	—	—	—	764	426	2,924	1,899	3,688	2,325
Miraa (*Catha edulis*)	Bundles	—	—	—	—	283,584	77,985	—	—	—	—	283,584	77,985
Onions	Tons	—	—	73	1,000	157	4,966	9	225	—	—	241	6,221
Palm Wine	Gal.	—	—	—	—	—	—	—	—	700,620	80,093	700,620	80,093
Potatoes (English)	180 lb.	15,506	16,000	3,300	3,750	97,887	104,831	—	—	—	—	116,693	124,581
Pulses	200 lb.	45,160	98,698	—	—	70,847	176,350	7,679	25,034	2,426	7,032	126,112	307,114
Pyrethrum	Tons	651	182,180	44	8,070	561	164,000	—	—	1	50	1,257	354,300
Rice Paddy	160 lb.	46,951	80,247	—	—	81,886	163,700	—	—	10,081	21,405	136,918	265,352
Pineapples	Tons	—	—	—	—	6,253	49,423	—	—	—	—	6,253	49,423
Sesame	180 lb.	10,670	40,597	—	—	—	—	—	—	4,390	20,892	15,060	61,489
Sisal	Tons	—	—	—	—	9	403	2,960	236,760	—	—	2,969	237,163
Sorghum	200 lb.	37,260	31,257	—	—	—	—	—	—	1,654	1,899	38,914	33,156
Sugar Cane	Tons	674	7,051	—	—	9,200	9,278	—	—	—	—	9,874	16,329
Tea	Cwt.	34,732	3,846	838	12	311,360	60,946	—	—	—	—	346,930	64,804
Timber	Tons	—	—	—	—	541	13,525	—	—	—	—	541	13,525
Tobacco (flue cured)	Lb.	—	—	—	—	1,389,794	5,787	33,180	2,289	—	—	1,422,974	8,076

TABLE D.—QUANTITIES AND VALUES OF MORE IMPORTANT PRODUCTS MARKETED FROM THE AFRICAN AREAS (PARTLY ESTIMATED), EXCLUDING NORTHERN PROVINCE AND MASAI DISTRICT—(*Contd.*)

Produce	Unit	Nyanza Province		Rift Valley Province		Central Province		Southern Province		Coast Province		Total	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
			£		£		£		£		£		£
Tobacco (Native cured)	Lb.	—	—	—	—	733,419 (snuff)	24,844	246,730	815	342,000	5,700	1,322,149	31,359
Vegetables and Fruit	Tons	—	—	—	—	11,368	200,711	1,080	52,288	948	50,061	13,396	303,060
Wattle Bark ..	Tons	28	180	1,000	1,260	20,827	176,000	1,676	16,338	620	5,580	24,151	199,358
Wheat	200 lb.	321	692	480	2,000	1,312	3,200	—	—	—	—	2,113	5,892
Wimbi	200 lb.	56,201	79,187	—	—	—	—	—	—	—	—	56,201	79,187
Miscellaneous ..	—	—	—	—	40	—	—	—	4,315	—	5,858	—	10,213
Livestock Products													
Beeswax	36 lb.	—	—	—	—	—	—	1,355	8,293	—	250	1,388	8,543
Cattle	Head	—	—	34,595	156,479	—	—	24,574	131,795	21,692	188,372	80,861	476,646
Eggs	Doz.	173,676	14,218	12,000	1,500	31,687	4,534	29,042	3,091	—	—	246,405	23,343
Ghee	36 lb.	14,120	49,420	120	600	—	—	1,355	7,317	300	1,500	15,895	58,857
Goats and Sheep ..	Head	—	—	41,421	25,000	—	—	23,387	23,387	1,082	1,352	65,890	49,759
Hides	Lb.	2,655,647	274,383	34,510	12,831	62,587 (*No.*)	81,115	45,628 (*No.*)	32,079	19,332	1,613	—	402,021
Milk and Cream ..	Gal.	—	5,000	—	—	113,374	11,337	—	—	—	—	—	16,337
Pigs (Porkers) ..	Head	—	—	—	—	1,785	5,472	—	—	—	—	1,785	5,472
Poultry	Number	19,317	2,897	24,000	3,100	34,791	6,030	111,742	20,240	—	30,700	189,850	62,967
Skins	Score	23,639	80,614	7,982	17,779	12,535	48,098	10,695	41,615	930	1,952	55,781	190,058
Totals ..		—	2,665,989	—	310,702	—	3,433,302	—	720,041	—	1,135,935	—	8,265,969
1959 Totals ..		—	2,406,977	—	—	—	3,138,120	—	608,140	—	1,378,155	—	—

TABLE E.—IMPORTS OF FRUIT INTO KENYA, 1960

		United Kingdom	S. Africa	Australia	Israel	Spain	Italy	Egypt	Crete	Denmark	Belgium	Total
Apples (40 lb.) ..	Cases	1,250	24,705	22,077	—	—	43,218	—	—	85	100	91,435
	Wt. (Tons)	22	441	394	—	—	772	—	—	1½	2	1,632
	Value (£)	2,751	39,157	39,753	—	—	51,870	—	—	195	155	133,881
Pears (40 lb.)	Cases	—	5,220	1,075	—	—	6,208	—	—	—	—	12,503
	Wt. (Tons)	—	93	17½	—	—	111	—	—	—	—	223
	Value (£)	—	7,342	1,427	—	—	14,787	—	—	—	—	23,556
Peaches (5 lb.)	Cases	—	3,900	—	—	—	590	—	—	—	—	4,490
	Wt. (Tons)	—	70	—	—	—	10½	—	—	—	—	80½
	Value (£)	—	1,772	—	—	—	2,225	—	—	—	—	3,997
Oranges (70 lb.) ..	Cases	—	7,850	—	6,998	—	—	725	—	—	—	15,573
	Wt. (Tons)	—	140	—	125	—	—	13	—	—	—	278
	Value (£)	—	15,220	—	8,751	—	—	1,223	—	—	—	25,194
Grapefruit (70 lb.) ..	Cases	—	—	—	799	—	—	200	—	—	—	999
	Wt. (Tons)	—	—	—	25	—	—	6	—	—	—	31
	Value (£)	—	—	—	892	—	—	300	—	—	—	1,192
Grapes (44 lb.)	Cases	—	23,002	350	—	5,715	—	—	2,000	—	—	31,067
	Wt. (Tons)	—	452	7	—	112	—	—	39	—	—	610
	Value (£)	—	14,869	1,118	—	25,911	—	—	4,000	—	—	45,898
Melons (44 lb.)	Cases	—	1,675	—	4,000	900	—	—	—	—	—	6,575
	Wt. (Tons)	—	32½	—	77	17	—	—	—	—	—	129
	Value (£)	—	2,741	—	6,300	3,755	—	—	—	—	—	12,796
Pomegranates (50 lb.) ..	Cases	—	—	—	378	1,125	—	—	—	—	—	1,503
	Wt. (Tons)	—	—	—	8½	25	—	—	—	—	—	33½
	Value (£)	—	—	—	825	3,313	—	—	—	—	—	4,138
TOTAL	Cases	1,250	66,352	23,502	12,175	7,740	50,016	925	2,000	85	100	164,165
	Wt. (Tons)	22	1,228½	418½	235½	154	893½	19	39	1½	2	3,014
	Value (£)	2,751	81,101	42,298	16,768	32,979	68,882	1,523	4,000	195	155	250,652

PART II.—RESEARCH AND SPECIALIST SERVICES

General Husbandry

Crops.—Observation plots of 16 Blight-resistant varieties of potatoes were planted during the long rains at Embu. The variety C.52 gave the best yield which was equivalent to eight tons per acre. Variety work has now been curtailed in Embu owing to the wide spread of Bacerial Wilt in that area. At Kakamega three varieties of potatoes were compared at two spacings. K.52 at a nine-inch spacing gave an increase of nearly one ton per acre over the 12-inch spacing and outyielded Dutch Robyjin and C.53. In trials at Mau Narok the variety Marritta yielded 14½ tons per acre which was significantly higher than all other varieties. The good yield followed heavy stocking by sheep for three years. In a trial at Elburgon three cwt. per acre of triple supers increased yield from 5·36 tons per acre to 6·47 tons but six cwt. produced no additional yield increase and there was no response to sulphate of ammonia.

An experiment at Kitale to compare various forms of phosphate fertilizer did not show any significant difference between them but there were indications that Japanese fused magnesium phosphate may be useful, depending on its price.

In a fertilizer rates and spacing experiment on maize also at Kitale which has now run for three years at Kitale and Cherangani and for two years at Endebess the best combination appears to be two cwt. per acre of sulphate of ammonia and one cwt. per acre of triple superphosphate and a maize plant population of 10,000 to 14,000 plants per acre. The response to sulphate of ammonia in the last two years has been strongly linear and higher rates will be worth testing.

Cultivation trials at Kitale showed that wider spacing (7 ft. × 2 ft.) of maize and interplanting with various other crops to improve the forage value of the stover after harvest reduced the maize crop. As a result of the wide spacing yield was reduced from 21·2 bags per acre to 18·7 bags and further reduced to 15·5 bags when Rhodes Grass was interplanted. Velvet Beans was the best of the interplanted legumes but reduced the maize yield to 18 bags per acre.

For the second successive year subsoiling at three feet intervals at Kitale to a depth of 16 inches had no effect on maize yields.

At the Coast trials on maize to test the effect of urea produced a linear response. One cwt. of urea per acre gave a yield of 1,470·8 lb. per acre as compared with the control yield of 889·9 lb. per acre.

In Nyanza Province good responses to nitrogenous fertilizers have been obtained at Songhor. Synthetic maize gave a much better response to nitrogen applications than local selections.

In the cotton trials at the Coast the varieties U.K. 51 and U.K. 58 outyielded the Ilonga Commercial strain at Msabaha near Malindi but the latter variety proved superior at Galole. At Galole significant increases in yield were obtained from early planted cotton. Planting on 11th April resulted in a mean yield of 1,674·9 lb. per acre compared with 1,099·3 per acre from a planting on 20th April.

Variety trials on field beans (*Phaseolus vulgaris*) in Southern Province have identified high-yielding varieties which in poor seasons can be up to 100 per cent better than Local Canadian Wonder. This superiority is closely related to speed to maturity. The varieties are Idaho Flat White, Michigan Pea Bean and Herbert Sprogget.

Observations on 16 mosaic-resistant cassava varieties at the Coast indicated that two varieties 53121/22 and 46106/27 were superior and these are being bulked for distribution.

A small plot of Lavendin has grown well at Embu but has not yet flowered.

In Nyanza a trial of 25 varieties of sugar cane resulted in N co 293 and Co 421 giving the highest yields of sucrose per acre. Applications of Gypsum at two tons per

acre gave a significant increase in yield. Under irrigation the variety Co 331 gave the highest yield of cane per acre and this variety has been noted as a consistently good performer in Nyanza.

In a comparison of two onion varieties at Kakamega—Bellary and Bombay Red—the former gave a mean yield under all treatments of 7·29 tons per acre of fresh onions compared with 5·71 tons per acre for the latter variety.

Fertilizers and Manures.—The main programme is directed from the Scott Laboratories and is reviewed under the heading "Soil and Agricultural Chemistry". Additional experiments were conducted by the field staff.

At Kanja in the bracken zone of Embu district it has become apparent as a result of trials that both lime and phosphate are essential for good establishment of seeded grasses. A trial to test the "composting" of double superphosphate with F.Y.M. in the cattle boma versus normal field applications of F.Y.M. and phosphate showed that a higher yield of potatoes could be expected from normal field applications. It has been established that the basic requirements for most soils in Central Province is F.Y.M. and phosphate.

At Sotik responses on grass leys to both superphosphate and gypsum have been recorded but it is thought that the sulphur requirements obtained from the gypsum can be better supplied in a nitrogenous fertilizer such as sulphate of ammonia. Kenya White Clover was more in evidence on the non-phosphate plots.

In Sotik six NPK trials showed a good response to phosphate although it was apparent from comparing soil test reports with responses obtained that there is a rapid decrease in response to phosphate for a relatively small increase in p.p.m. available phosphate shown in the soil test.

In Machakos it has been shown that the yield of maize receiving one cwt. per acre of double superphosphate or the residue of one cwt. per acre applied to a previous crop, is greater than the yield of maize without phosphate by a constant amount, regardless of the yield of maize without phosphate. As other work has shown that maize yields in Southern Province are linearly related to rainfall, the increase in yield from superphosphate is relatively greater in season of poor rainfall. A further point of interest is that the actual increment due to phosphate is constant for the variety of maize; local white yields are increased by 600 lb. and Taboran yields by 200 lb. per acre.

At Eldoret F.Y.M. was applied to maize at different times—31st January, 26th February, 21st March and 23rd March the latter being a top dressing immediately after planting the maize while the first three were ploughed in after spreading. Interim results indicate that the later the application the greater the yield although in this season the top dressing treatment probably had a beneficial effect during the drought just after planting.

Another experiment was started at Eldoret in 1959 to compare various types of farmyard manure. In that year 10 tons per acre of pig manure gave a higher maize yield than the same dressing of either cattle manure or poultry manure and than 200 lb. per acre of triple supers. No reapplications were done in 1960 and wheat was grown to assess residual effects. The wheat on the pig manure plots lodged badly which resulted in a greatly reduced yield—10·29 bags per acre compared with 10·84 bags on the control plots and between 13 and 14 bags for each of the other three treatments—cattle manure, poultry manure and triple supers.

Animal Husbandry

Cattle.—At Kitale results from calf-feeding trials so far indicate that "early weaning" depresses the growth curve during the early stages of life and is not economic in a butterfat market with skim-milk available. The small benefit from feeding concentrates to a calf which is still receiving skim-milk is highly uneconomic under the Kitale calf-rearing régime. The milk production of Jersey cows on a feeding trial at Kitale has gone up this year as a result of "steaming up"—a treatment which was not applied last year.

The beef experiment at Perkerra which started in 1959 will be completed early in 1961. The object is to compare three breeds and two methods of feeding, i.e. grazing on irrigated star grass versus stall feeding on Napier Grass also grown under irrigation. The three breeds were Hereford half breds, Sahiwal half breds and local natives. The Sahiwals and natives on arrival in 1959 were in poor condition and gained weight rapidly at the start, then slowed down, whereas the Herefords gained weight steadily throughout the two years. The mean overall liveweight gains per day up to the end of 1960 were:—Herefords 0·80 lb., Sahiwals 0·65 lb., natives 0·65 lb. Some observations made on the behaviour of the breeds are of interest. The Sahiwals were reluctant to graze the Star grass closely and therefore required a larger total area to support them than the other two breeds. The Herefords and natives were supported at the rate of four beasts per acre of Star grass, the Sahiwals at four beasts to 1¼ acres. The Sahiwals appeared less heat tolerant than the Herefords and put on less weight in the dry season. On the other hand, the Sahiwals continued to gain weight during the rainy weather whereas the Herefords slowed down at those times.

Pigs.—The main objective of work at Kitale is to find out to what extent maize can be safely included in the rations of bacon pigs and the best form of protein food to use with it. At present three levels of maize in the ration are being compared, i.e. 74 per cent, 64 per cent and 54 per cent up to 120 lb. liveweight then 80 per cent, 70 per cent and 60 per cent up to slaughter.

An experiment was undertaken at Eldoret to determine if the P.I.B. protein and mineral concentrate could replace skim-milk in the baconer ration. The control ration consisting of barley, maize, minerals and skim-milk gave the best results for liveweight gain, conversion ration and carcass grading. It was apparent however that the P.I.B. concentrate could be a useful protein supplement for a farmer who has no skim-milk available. It may also be particularly useful to farmers whose pigs are soft setting as it appears to be a good fat hardener. It was calculated that when skim-milk is plentiful and cannot be sold for more than 26 cents per gallon this should be fed, but between 26 cents and 72 cents per gallon it can be partly replaced by P.I.B. concentrate while over 72 cents it is most profitable to replace it entirely by the latter.

Another experiment investigated heavy hog production. Three rations were compared each being fed *ad lib.* The results of the experiment suggest that heavy hog production, given a market, could be more profitable than the present production for Wiltshire bacon in the case of farmers obtaining an average return of Sh. 227 to Sh. 230 or less per baconer.

At Ol Joro Orok an experiment to determine the optimum level of restriction needed in the feeding of a baconer rations consisting of cereals and P.I.B. supplement indicated that "heavy" restriction of feeding is desirable both before and after 100 lb. liveweight. At the same station a comparison of three levels of oats replacing part of the barley in the baconer ration, i.e. 15 per cent, 30 per cent and 60 per cent up to 100 lb. liveweight and then 15 per cent, 20 per cent and 30 per cent respectively is in progress. During the first three months of the trial the first two rations have given the same liveweight gain, but the rate on the third ration (highest level of oats) has been slower.

Sheep.—At Ol Joro Orok in an experiment on fat lamb production, pure Corriedale lambs were compared with cross bred lambs, namely Corriedale × Hampshire Downs and Corriedale × Border Leicester. Two years results are now available from which the following conclusions have been drawn under Ol Joro Orok conditions. Pure Corriedale lambs may be best kept on for a wool clip at one year then sold as Highland mutton. The Corriedale × Hampshire Down produces good Highland lamb at 4½–5 months old. The Corriedale × Border Leicester wether lambs can also produce a good return as Highland lamb but are less well finished. This cross may also be of interest for further crossing.

Studies on milk production of ewes of various breeds and crosses are continuing.

Poultry.—Two farm-mixed rations were compared at Eldoret for egg production by Rhode Island Red × Light Sussex hens. The results indicated that both these rations, although cheaper than the standard commercial ration on a weight basis were more expensive when assessed in terms of eggs produced.

In another experiment also at Eldoret the object was to test the effect on egg production of artificial extension of day length in batteries and deep litter houses. Kerosene lamps were used from 6 p.m. to 9 p.m. each evening. Results suggested a possible small increase in laying percentage due to artificial lighting especially with the battery fed group. A more accurate experiment is planned with electric light.

Grassland

Kitale.—The scope of the plant introduction and nursery work has been reduced, and more effort has been put into selection and strain building, especially with Rhodes grass (*Chloris gayana*). One hundred and three new introductions were brought in and tested during the season, and amongst these the best were Guinea grasses (*Panicum maximum*) from Nakuru and Florida, two varieties of Rhodes grass, a variety of *Setaria sphacelata* from Marsabit, Kenya, and a variety of *Panicum coloratum* from South Africa. Much intensive work has been done on Rhodes grass ecotypes, and these have been studied by means of single plant plots, which have shown that a wide degree of variation occurs within each ecotype amongst almost all vegetative characters and also some inflorescence characters, giving excellent scope for selection, which is now proceeding. Chromosome counts of Rhodes grass varieties showed that varieties differ in this respect.

In a small field scale grazing trials with selected varieties of *Setaria sphacelata*, the well-known Nandi Setaria has shown itself to be the best so far.

In the herbage agronomy work, a comparison over two years of seven Rhodes grass varieties has shown the Chepararia and Mbarara varieties to produce the largest yield of leaf, followed in order by the Masaba, Rongai, Mpwapwa, Nzoia and Alego varieties. In long-term trials, the Nzoia variety rarely lasts more than two years. Trials with the three clovers, Ladino, Louisiana white, the Kenya white clover, show the latter to be the most drought-resistant. Work on dry-season pastures, using Gold Coast Elephant, Sigor guinea grass, Molasses grass and giant Setaria, has shown that when used during the dry season, they produce about 30 per cent less crude protein per acre compared with the rainy season, but they are nevertheless very useful feed. In a comparison of species for annual forage production, Sudan grass, perennial Kavirondo sorghum and Velvet sorghum gave higher yields than either oats or maize during a full season's growth.

In the investigations on the major element requirements of herbage plants on the local basement complex soils, work has been done on calcium, sulphur, potassium and magnesium responses. In a lucerne experiment, the addition of 32 lb. of pure sulphur per acre increased the yield by 1,000 lb. of dry matter per acre (significant at 0·1 per cent level) over that obtained from 450 lb. per acre of triple superphosphate alone, which increased the yield by 1,900 lb. compared with no phosphate. In another lucerne experiment, the addition of magnesium together with phosphate increased the yield by 1,200 lb. D.M. per acre compared with phosphate alone, and was significant at the 0·1 per cent level. In another lucerne experiment, the addition of potassium to an application of magnesium, sulphur and phosphate resulted in an increase of 850 lb. of D.M. per acre, significant at the 1 per cent level. In an experiment with Rhodes grass, the addition of 100 lb. of potassium, and 20 lb. of magnesium contained in fertilizers, gave a 25 per cent increase in yield, significant at 0·1 per cent. A significant response by Rhodes grass to the addition of sulphur has been obtained for the first time, which will be investigated further. These results taken as a whole illustrate the importance of a properly balanced and adequate fertilizer application on sandy basement complex soils.

In the animal agronomy work, the objects of the current experiments are to determine the amount of milk which can be obtained from grass alone with no supplements, and to observe the effects of stocking rate on milk production. While most lactations are not yet completed, it seems from results so far that a yield of 500 gallons of fat corrected milk can be obtained from grass from the right animal, and also that more intensive stocking rates tend to increase the yield of milk per acre and to decrease the yield per cow. The biggest differences in production, however, have occurred not between management treatments or species, but between different twin

pairs; in other words, low milk yields are not necessarily due to the quality of the grass, but can be caused equally well by the limited milking capacity of the cows concerned. Hitherto, the grass rather than the animals has been regarded as the limiting factor to higher milk production in the district. Results seem to indicate that some judicious culling in commercial herds would help to raise the milk production per acre substantially.

Seed production is an important line of work on the station, and 60 acres of mother seed of the following selected strains is under production for commercial use, namely Masaba, Mbarara and Mpwapwa Rhodes grasses, Nandi Setaria, Slender Guinea grass, Coloured Guinea grass (*Panicum coloratum*), Kitale Molasses grass, Kenya white clover, and Signal grass (*Brachiaria ruziziensis*) from the Congo. The highest yield was from Slender Guinea grass (*P. maximum* var. *trichoglume*) at 325 lb. seed per acre. Several others produced 200 lb. per acre, but the overall average was 105 lb. per acre with a total of over three tons of seed produced. Nine farms are now producing certified seed on a total of 300 acres, and almost all of this is in the Trans Nzoia district.

In the Chemistry laboratory, a large amount of data on the changes that take place in the chemical composition of grasses, cereals and legumes during their growth and maturation under field conditions have been obtained over many years. These data have been examined from the standpoint of plant/animal relationships with the result that it is possible to predict the apparent nutritive values of ruminant and pig feeds from knowledge of the amount of crude protein that they contain in their dry matter. It is also possible to modify the nutritive value of each feed according to the amount of crude fibre it contains in its dry matter. The nutritive value of each feed embraces the amounts of digestible crude protein, total digestible nutrients and gross digestible energy contained in the dry matter of the feed.

This knowledge can be used to assess the nutritive value of Kenya pastures throughout their growth. It can also be used for the computation of ruminant rations and pig rations in accordance with the well-known Morrison or Woodman standards for cattle and the local standards for pigs.

Kamasia Substation.—At the Grassland Research Station at Marigat, experimental work on the drier natural grasslands of the Rift Valley Province has continued throughout 1960, supplemented by studies on both ley grasses suitable for marginal areas and irrigated pastures at Marigat itself. All but the latter were affected by the low rainfall experienced over much of the area served. One survey was undertaken during the year, on "The Grazing Areas of the Lower Uaso Nyiro Basin".

Further information obtained on the reseeding of denuded areas indicates that the initial success is as dependent on enforced protection from grazing as it is on favourable rainfall and the choice of adapted techniques and materials. Controlled grazing schemes can only provide the degree of protection required if the rotation is strictly enforced. Adapted varieties of *Eragrostis superba*, *E. curvula* and *Cenchrus ciliaris* have emerged as the most suitable grasses for normal reseeding purposes, though under the peculiarly adverse conditions at Marigat, none of the available species can be relied upon to persist. The search for more drought-resistant material continues.

Experiments on the control of dense *Acacia/Tarchonanthus* bush have shown burning to be beneficial, partly through the direct suppression of the fire sensitive species, but particularly through the increased competition exerted on the more pernicious species by the rejuvenated grass cover. Where conditions necessitate mechanical clearing prior to burning, the Holt IXA has proved useful, but subsequent reseeding has been shown to be necessary both as an aid to burning and to control (by competition) the increase in seedling trees which the Holt produces. For a good burn, it has been necessary to allow two seasons' rest to elapse following clearing.

In comparison with twelve other grasses at Chemogoch, S. Baringo, *Chloris gayana* (Rongai) has continued to show its superiority as a ley grass for marginal conditions. The Endebess and Mpwapwa varieties of the same species have, together

with *Panicum coloratum* and *P. maximum* var. *trichoglume*, proved to be outstanding under irritation at Marigat, providing fresh grazing every 15–18 days. Under these conditions, companion legumes cannot compete, and only *Clitoria ternatea* has survived beyond six months in a productive state. Optimum legume growth can only be obtained by the use of slower growing companion grasses (e.g. *Melinis minutiflora*), with a resultant fall in overall productivity.

Katumani Substation.—At the Katumani Experimental Station, Machakos, the total rainfall for the year was about average, namely 23 inches, but the distribution was very poor. The dry conditions showed up the lack of drought resistance in the Rhodes grass varieties, and the probable advantage of seasonal arable silage crops compared with planted grasses, for obtaining maximum yields of dry matter per acre.

The experiments on silage crops have shown that maize, bulrush millet and Sudan grass are generally the most satisfactory. The rather lower yield of Sudan grass is counterbalanced by the excellent aftermath grazing which it produces. However, the aftermath grazing can only be produced at the expense of subsoil moisture, and other work on the station has shown that this may be a big disadvantage of Sudan grass when used in a rotation where crops are planted each rainy season. The silage mixture of maize planted at 2 ft. × 1½ ft. with white *Dolichos lablab* (Njahi bean) has proved very satisfactory so far.

Experiments on grass burning have shown that at least ¾ ton of dry grass is needed in order to get a satisfactory burn and that where the proportion of susceptible bush species is high, quick changes can be brought about by fire. However, caution is needed in burning steep land because the inevitable reduction in basal cover may lead to erosion.

If properly controlled, goats will assist in keeping regenerating bush from getting so tall that it cannot be kept in check by periodic fires.

Molo Substation.—At the Molo Grassland Research Station, the most interesting development has been the regeneration of a subterranean clover and grass sward on a field scale, as a result of cultivation, and the application of one cwt. to the acre of triple superphosphate. On a plot scale, yields of over 25 tons of green material of this clover to the acre have been obtained, but difficulty has been experienced in getting it to regenerate the following season in the field. It now seems that further applications of superphosphate, together with suitable methods of mechanical cultivation may help to solve this problem.

Subterranean clover seems to be the most productive clover at this altitude, and seems well adapted to the relatively cool and somewhat acid soil conditions which occur widely in the Molo area.

Coffee

Entomology.—Specific investigations carried out during the year included Leaf miner, White Waxy Scale, Lace Bug and Tip Borer.

A study of the basic principles affecting the integration of insecticidal and biological control of Leaf miner *Leucoptera* spp. was started by Professor Bess who is on a Fulbright Scholarship for nine months at C.R.S. Many interesting facts are already emerging from this work.

The main points in the life history of White Waxy Scale *Ceroplastes brevicauda* Hall have been elucidated. There are two generations a year, maturity being reached during the main rainy seasons in April and November. Eggs hatch under the carapace of adult scales and the crawlers move to fully hardened leaves where they settle. The early instars remain on the leaf for a period before finally migrating to adjacent green shoots. While still on the leaves, normally in July and February, the young scales can be controlled by high volume sprays of 2·5 per cent white oil or 0·15 per cent Malathion. However, once they have taken up their final positions on the stems, insecticidal methods of control appear to be completely ineffective. Waxy scales from the West Rift areas have been provisionally identified as *Ceroplastes destructor*, a species previously not recorded from coffee in Kenya.

It has now been ascertained that the species of Lace Bug found in Kenya is *Habrochila ghesquierei* Schout, and field studies have been initiated to study the life history of this species. The egg period varies between 18 and 32 days, but full details of the nymphal period are still being worked out. On completion of this work revised recommendations on timing of spray applications will be issued. No reports have yet been received of this pest extending its range into the Meru and Machakos districts.

Spraying the lower six feet of the trunks of shade trees with 2 per cent D.D.T. at the time of adult emergence has continued to give excellent control of Tip Borer *Eucosma nereidopa* Meyr. and this method of control has now been adopted as a standard recommendation.

Chemistry.—The soil nitrogen studies, comprising field trends and fluctuations of natural nitrate nitrogen were concluded early in 1960. The results have continued to show a steady build-up of nitrate in the top soil during the dry weather following the rains.

The influence of Napier grass mulch on the nutrient levels of the ripe coffee cherry has been investigated. Ripe cherries were sampled over a period of one month at weekly intervals. Mulch has significantly raised nitrogen and phosphorus levels in the ripe cherry. Calcium and magnesium levels were lowered while potassium levels were unchanged.

The results of sodium nutrition studies have continued to show an increased uptake of sodium by the coffee tree following the use of sodium nitrate fertilizer. This effect is shown in both young and old leaves. Sodium nitrate fertilizer has reduced leaf potassium and raised leaf magnesium levels, particularly in the absence of a Napier grass mulch.

Micro-pot test work with sodium and potassium has indicated that sodium and potassium, singly or combined, will increase the dry weight of seedlings growing on Kikuyu red loam soil. Higher levels of sodium were found in the soil and in the leaves where sodium had been used.

Pathology.—Leaf Rust (*Hemileia vastatrix*) has been recorded from Robusta coffee for the first time in Kenya. It was recorded from North and Central Nyanza.

Field fungicide trials for Leaf Rust have been concluded. Burgundy mixture and 50 per cent formulations of cuprous oxide and copper oxychloride still remain the standard recommendation. It is considered that further comparative fungicide trials should be postponed until more is known about dosage and distribution requirements for Leaf Rust control and until laboratory methods, for testing the numerous products now available, are standardized.

A preliminary experiment with low volume spraying has indicated that adequate control of leaf rust can be achieved with less than 10 gallons of spray fluid per acre. Further experiments to confirm these results and to translate experimental low volume spraying to practical field recommendations are in progress.

It has been observed that in coffee nurseries that have been in continuous use for several years a general loss of vigour occurs which is not attributable to a decline in soil fertility or structure. Marked stimulation of growth of seedlings has been produced following soil fumigation treatment. To what extent the beneficial fumigation effect can be attributed to eelworm control remains to be assessed, but high counts of free living parasitic nematodes have been made in nurseries where loss of vigour in seedling growth has occurred.

A coffee seedling disease affecting plants suffering various adverse conditions has been associated with infection by *Fusarium oxysporum*, which attacks the stem just above ground level. Healthy seedlings do not appear to be susceptible.

Physiology.—The growth experiments at Scott Agricultural Laboratories were discontinued in March and those at the Coffee Research Station in November, enough data being available. The badly distributed rainfall of 1960 was reflected in the lower growth total during the year but the effect of the treatments continued to produce results similar to previous years.

Carbohydrate accumulation and depletion in the coffee plant is being studied by two lines of investigation, one comprising the chemical analysis of branches, leaves and crop and one following the development of starch in branches by means of visual scoring after staining with iodine. The former one is coupled with a chemical analysis of the minerals found in the leaves.

Observations on growth and stomatal behaviour in relation to irrigation practice were started, while the relation between stomatal aperture, water deficit of leaves and soil moisture were studied, mainly in pot experiments.

Studies in leaf abscission and its prevention by spraying with chemicals were continued.

Observations on the "Hot and Cold" and "Crinkle leaf" conditions were extended by spraying with Captan in order to try to control the latter disease, thus following suggestions made by the Coffee Berry Disease Research Unit as a result of their experiments.

Coffee Berry Disease and Hemileia Research Unit.—Coffee Berry Disease.—Results from field experiments both East and West of the Rift have confirmed previous ones; the critical periods for control treatments therefore in both districts remain as already published. For the first time, comparative trials of different fungicides have been successful, and copper formulations have proved the best. It seems probable, at least for the West Rift districts, that a schedule comprising both copper and Captan may result in the simultaneous control of Coffee Berry Disease, of Leaf Rust, and of certain growth abnormalities, especially the condition known as "crinkle-leaf".

Throughout the year, weekly assessments of conidial production from bearing wood have been made, and related both to disease incidence and to the level of control. From these, and from laboratory studies which began in 1958 it is now concluded that control can only be achieved by reducing the inoculum-production of the bearing wood, and that attempts to protect the berries are not effective. The results of all field and laboratory studies up to the present are now either already published, in the press, or in an advanced stage of preparation.

Leaf-Rust.—The principal laboratory results, now fully confirmed by extensive field studies, are that *Hemileia* spores are dispersed over very short distances by rain, and not over long distances by wind; that infection follows more closely the pattern of a water-borne pathogen than that of a typical rust in that a high inoculum-density is required; and that while dry spores can remain viable for a long time, they become highly susceptible to desiccation after being wetted for a few minutes only. Other laboratory studies are in progress but as yet incomplete.

Field work in both East and West Rift districts has comprised a large number of comparative fungicidal trials, timing trials, and epiphytological studies. It has now been shown that copper formulations are more effective than any of a wide range of other fungicides so far tested; that rust outbreaks are of local origin; that mis-times or inadequate control measures can induce a rust outbreak of many times normal severity; that yield-increases resulting from proper control are high; and that effective control must be based on very critical timing, the principle being the prevention of infection over a very short critical period, rather than the long-term protection of foliage.

Field Trials.—The rainfall distribution in 1960 was particularly unfavourable to coffee production and, following the dry year of 1959, substantial responses to irrigation were to be expected. The irrigated coffee yielded 16·22 cwt. clean coffee per acre, while trees irrigated whenever the soil began to dry out produced 27·48 cwt. The main experiment is designed to determine the critical seasons for supplemental irrigation. The artificial prolongation of the short rains by irrigation in early December resulted in a yield of 18·78 cwt., but the extension of the long rains by irrigation in May and June failed to raise the yield of coffee. The most critical season for irrigation appears to be August (21·33 cwt.); from evidence so far available this importance is based on

the following effects. August irrigation sustains vegetative growth through the dry months of September and October so that a large flowering is not induced in early November by the onset of the short rains. Flowering has occurred on these plots on several occasions during the short rains. In 1960 the peak picking from these plots occurred at the same time as from the irrigated coffee (July), but thereafter the coffee irrigated in August sustained a high level of production, while the yields from all other coffee fell off rapidly.

A comparison between sprinkler irrigation and watering individual trees with a piped supply has shown that there is no significant difference between the resulting yields of coffee where the ground application has been at half the gallonage applied by the sprinkler system.

In 1957 several trials were initiated to determine the response to magnesium fertilizers in the presence and absence of mulch. In none of the four subsequent seasons has the application of magnesium fertilizer to the ground raised the yield of clean coffee.

Responses to mulching were particularly marked in the 1960 season, which was notable for the very poorly distributed rainfall. A typical result from young coffee planted in 1956 was that alternate inter-row mulch raised the yield from 7·61 cwt. to 12·00 cwt. of clean coffee per acre.

The investigation of low volume spraying was intensified during 1960 and it was found possible to control Leaf Rust to a satisfactory extent using less than 10 gallons of spray per acre. This technique is not yet recommended as satisfactory equipment is not available for its general application.

Trials in African Areas.—During 1960 a substantial volume of information, mostly of an observational nature, was collected from the numerous coffee variety and exploratory trials distributed throughout the African areas. In many areas results obtained from variety trials proved to be invaluable when assessing prospects for coffee-growing in new areas.

Preliminary information was obtained on the liquoring qualities of the Indian varieties S288, S333 and S795. The liquoring reports have so far shown that these varieties produce coffee of an inferior liquor to that obtained from varieties such as SL28 and SL34. More liquoring samples will be prepared from the Indian "S" varieties during 1961 and a more reliable assessment of quality should then be possible. All these varieties continued to show immunity to Races I and II of the Leaf Rust *Hemileia vastatrix*. The five Leaf Rust resistant selections of the B.A. series obtained from the Coffee Research Station, Balehonnur, Mysore, are now successfully established in Rust Exposure trials.

At the Chemoge Variety trial (altitude 6,700 feet, Elgon Nyanza District), Elgon Die Back has attacked most of the varieties in the trial with great severity. It was observed that the variety Geisha showed considerable resistance and to a lesser extent the variety Padang. The intensity of attack was not reduced by the presence of shade. An experiment has been initiated at Chemoge with the object of finding a method of controlling the disease.

The Coffea canephora pruning and spacing trial planted in 1958 at Busia (Elgon Nyanza District) has produced a first small crop in 1960. Valuable information has been obtained concerning the vital necessity for shelter belts and shade trees. Without either the growing of *Coffea canephora* in Nyanza Province, is virtually impossible, because of the serious incidence of "Crinkle-leaf". An experiment has been initiated to obtain information on whether a market premium of sufficient size exists for washed Robusta over sun-dried Robusta, to warrant the erection of small coffee pulperies to process the crop.

Seed of *Coffea excelsa* has been distributed from trees growing at Ishiara (altitude 2,900 feet) in Embu District, with a view to raising seedlings for new exploratory trials in areas wheich may have conditions suitable for the growing of this crop.

Pyrethrum

Breeding.—194 new single plant selections were made and a total of 557 was under observation. Eighty-six clones tested over the past four years were bulked up for further breeding work. Thirty-nine isolated plots were maintained for the production of new hybrids and the "Sugar Beet" breeding systems at Molo and Subukia were continued in 14 large plots. By the end of the year there were 31 seed production fields for 28 varieties and during the year 8,493 lb. of seed were supplied to the Pyrethrum Board for distribution to growers. In 20 yield trials spread over a wide range of suitable growing areas the latest hybrids were tested with the result that M.51, M.54, M.55, M.56, M.65, 0·7 and 0·31 have been proved for issue from 1961 onwards.

Fertilizers.—Experiments over a range of soil types have again shown that the main responses are to be derived from phosphatic fertilizers. There is some indication of a depressing effect from potash and that sporadic responses to calcium (ground limestone) were hardly economic. On certain soils however it appears that gypsum was responsible for a slight increase in yield. None of the minor elements molybdenum, copper and zinc produced any response. Irrigation to supplement the scanty rains during the year resulted in a better establishment of the plants and higher yields.

Trials.—The rotation trial started in 1947 has now demonstrated that continuous cultivation of pyrethrum on the same land will result in diminished yields. If it is necessary to continuous cropping to be undertaken phosphate fertilizers are essential.

Sisal

Nurseries.—Good responses have been obtained from both sisal waste applications and irrigation. The effect of nitrogen application was non-significant. The effect of either waste or irrigation was to increase the average plant weight from 1·6 to 1·7 lb. while the combined effect of both treatments was to increase the average plant weight to 2·1 lb. An increase of 0·1 lb. per plant over 29·040 plants per acre is equivalent to an increase of about 1⅓ tons of planting material per acre over the 12 months cycle of the trial. There is an indication of a substantial build-up of fertility in the F.Y.M. plots. The average plant weight after 21 months was just under 3 lb. per plant where no F.Y.M. or Waste was applied to about 8·3 and 5·4 lb. respectively where an application of 30 tons per acre had been made. Responses have also been noted from gypsum, phosphate and potash applications. Two further trials have been established, one to study sprinkler irrigation and the other the effects of sisal waste, nitrogen, sulphur, phosphate and magnesium. The latter trial will also be used to study the evenness of plants from a so-called "smother nursery", i.e. a nursery planted at 350,000 to 400,000 plants per acre left for six months and then transplanted to the normal 2 ft. × 9 in. spacing in a nursery at 29,040 plants per acre. The idea is to let weak plants and late starters reveal themselves before planting into the nursery proper in the hope of finally establishing more even plants from the nurseries.

Plant Management.—The contention that 2,000 plants per acre can be grown everywhere in Kenya remains unchanged as a result of spacing trials. The most promising spacing is in a double row allowing the individual plants greater growing space than in a single row when the plant population and row spacing are the same. Trials were planted to observe the effects of leaf and root trimming of nursery plants before planting out in the field, the effect of leguminous cover crops in the field and interplanting of pineapples both for fibre at close spacings and fruit at normal spacings. The pineapples are planted in 8 ft. strips between the 13 ft. sisal lines.

Fertilizers.—Applications of sisal waste at rates less than 50 tons per acre are not recommended as the responses at lower rates are too small to justify the cost of application. The waste is spread in 6 ft. to 8 ft. strips under the planting lines thus forming an actual application of approximately 100 tons over half the area. Sulphate of ammonia is applied each rains for the first three years at a rate of not less than 2½ cwt. per acre, at plant populations of 2,000 plants per acre with the first application six to nine months after planting when the young plants have established a root system. Further trials have been established to study methods of sisal waste application and rates of different nitrogenous fertilizer applications.

Other Work.—The effects of spraying butyl Ester of 2,4-D and the Amine Salt of 2,4-D on to nursery plants when they were 3, 6 and 9 months old showed that even at dosage rates as low as ½ lb. acid equivalent per acre these chemicals had an adverse effect on the plants at whatever stage of growth they were applied. Serious damage and killing of plants was observed when the dosage rates of 4 lb. acid equivalent was used. The effects of CMU and MCPA were small and it is felt that these can safely be recommended for broad-leafed weed control in nurseries.

Dalapon applications at 7½ and 15 lb. per acre applied at 3, 6 and 9 months old Nurseries severely upset the growth of the plants and application of this nature cannot be recommended. Control of couch grasses and perennial grasses with dalapon must be done before the bulbils are planted into the nursery and only in extreme cases can a post-planting treatment of say 5 lb. dalapon per acre be suggested.

Horticulture

Marketing.—Pineapples provided nearly half of the total produce exported by air to London and over one-third of the total to all destinations. In August pineapple exports by road to Southern Rhodesia were started and this trade seems likely to continue. In December an experimental consignment exported from Mombasa to London by sea was partially successful. Four cases of lemons included with this consignment were well received. Approximately 14 tons of French Beans and 12 tons of mangoes were sent to London by air. Nearly 22 tons of tropical vegetables were exported of which Okra about 10 tons and fresh chillies about eight tons formed the bulk.

Citrus.—Assessment of samples of Kenya lemon juice for commercial use has been satisfactorily concluded. Trees of the correct varieties for lemon juice production are being produced at Thika and the first issue will be available for planting in 1961. Budwood has been imported from Italy and South Africa.

Pineapples.—The canneries continued to operate below capacity and the Department mounted a campaign for increased production the target being at least 23,000 tons by 1962 compared with 11,236 tons in 1960. Trials at Thika have proved economic responses to heavy applications of nitrogenous fertilizers with marked increases in the yield of Grade I fruit. First crop yields have been raised from 19·1 tons valued at £158 per acre to 29·4 tons valued at £294 per acre.

Trials are proceeding to determine optimum size of planting material, depth and time of planting, optimum spacing and fertilizer applications, green manuring, the value of soil fumigation and the use of flower induction hormones.

Onions.—Production is still inadequate for local needs but has improved in both quantity and quality. Trials at Thika have shown a profit of approximately £75 per acre with the variety Bombay Red grown on a red soil. For a trial on heavy vlei soil a slightly lower profit was realized.

Tomatoes.—There was no production of tomatoes for canning in 1960. There was a glut of tomatoes on the fresh market at certain times particularly from Machakos district.

Asparagus.—The abnormal condition of asparagus spears described in last year's report continued at Thika. The cause of the trouble is still unknown. Trials at Molo gave a net return of over £65 per acre. Best yields were obtained from cuttings in March and April in a four-year trial.

Strawberries.—The increase in production resulting from improved cultural methods has caused the price of relatively high grade strawberries to fall on the local market.

Trials at Molo indicate that a heavy dressing of F.Y.M. at 40 tons per acre produces the best results.

Trials also show a falling off in yield in the second year of cropping and indicate that the period April to June is the best for heavy yields. Newly imported planting material of the variety Cambridge Favourite gave greatly superior yields when compared with three-year-old splits.

Plant Pathology

Diseases.—1960 was a very dry year and disease incidence was generally low; only 350 specimens were submitted for diagnosis compared with 638 in 1959. Bacterial Wilt of potatoes caused by *Pseudomonas solanacearum* was the subject of detailed surveys as it is a threat to the whole potato industry. Smut (*Ustilago scitaminea*) on sugar cane is increasing in severity and, so far, growers have taken no steps to control it. A disease of geraniums grown for essential oil was investigated. The causal organism is a species of *Graphium* which, however, is only weakly pathogenic and will not invade healthy plants. It causes considerable damage to cuttings and its severity is reduced by the use of a 0·5 per cent Captan dip. Work with the Australian passion fruit vines supposedly resistant to woodiness disease continues. Experiments on the control of *Puccinia graminis* on wheat by the use of foliar fungicides produced inconclusive results. An experiment was started to test the effects of various fungicidal seed dressings on the longevity of coffee seed. Seed dressing trials were conducted on beans, peas and maize; and it appears that maize may not need fungicidal seed dressings in Kenya. Pea yields were significantly increased by the use of four ounces of Captan per 100 lb. of seed.

Eelworms.—Nematode research included an investigation into the statistical requirements of trials using heterozygus seedling material as nematode-free, clonal material is virtually unobtainable. Pot tests on imported varieties of root-knot resistant tomato varieties revealed a fair degree of susceptibility to *Meloidogyne javanica* and *M. hapla.* Successful control of soil-borne species of *Meloidogyne* was achieved with Shell DD, ethylene dibromide and methyl bromide. More than a hundred specimens were sent to the Commonwealth Mycological Institute for determination.

Legume Bacteriology.—300 Rhizobium extended evaluation trials were conducted throughout Kenya. Each trial consisted of one inoculated and one uninoculated plot only and recorded data of a presence or absence nature only, ten legume species being involved. Eleven randomized block trials were conducted to measure the amounts of nitrogen fixed by various legume species, but were largely spoiled by drought. *Rhizobium* mortality rates in culture were determined using various storage methods with a view to determining accurately the expiry period of S.A.L. inoculant. Bacterial counts were also made to determine inoculant dosage rates in terms of numbers of *Rhizobium* cells per seed. Development of the *Rhizobium* bank, a collection of *Rhizobium* strains in nodules or living legumes continued. 109 orders for S.A.L. inoculant involving 667 units sufficient for approximately 17,000 lb. of seed were received during the year.

Potato Development.—All aspects of potato development have been reviewed and assembled in a new development programme which aims chiefly at high yields by virtue of efficient disease control. The most important diseases are bacterial wilt (*Pseudomonas solanacearum*), blight (*Phytophthora infestans*) and leaf-roll virus, in that order. The effects of gibberellic acid as a sprout promoter were investigated; although sprout formation was accelerated, there were adverse after-effects on the crop.

Seed Testing.—2,616 samples were tested for purity and germination. Seventy-nine seed specimens were identified. An experiment was begun in which the mortality rates of seed during storage in paper envelopes and vacuum-packed tins both at Mombasa and Nairobi are being compared.

Entomology

In Coccid taxonomy a paper dealing with the descriptions of a first group of thirty new African mealybugs was completed and sent to the press. Routine identifications of Coccids were carried out for the East African territories.

The Cochineal insect, now identified as *Dactylopius indicus*, continues to spread slowly but has died out at Mariakani. On the other hand, prickly pear from Mariakani, grown at the Scott Agricultural Laboratories, has been completely destroyed by it. Control of Lantana by introduced insects is slight and further introductions are necessary. The parasite, *Eretmocerus serius*, introduced from the Seychelles has

successfully established itself on the host *Aleurocanthus woglumi* and is spreading in the Coast Province.

The experimental programme to appraise the use of large polyethylene covers as a means of protecting bagged produce from reinfestation by secondary storage pests was continued. Very large stacks were covered in Maize Marketing Board stores in Nairobi and Mombasa. Though problems arose relating to material strength and moisture translocations the trials were justified and the technique can now be applied commercially.

A large bag experiment on the admixture of insecticidal dusts with maize was completed at Kisumu. The superiority of Malathion dust at eight parts per million was established and the use of this dust in place of Lindane for admixture is now recommended and is permitted by law.

Further efforts have been made to establish more refined sampling techniques for use in bag and stack experiments. A technique for trapping flour beetles has been developed and a study of their population has been initiated to further test the technique.

The results of two earlier experiments with polyethylene covers and the experiment with admixing dusts have been prepared for publication.

At the Coast, liaison with the Chief Grader and Inspector has been confined to pre-export ship inspections, low density infestation of *Trogoderma granarium* in certain imports, maize export problems, and imports of Australian wheat.

Trogoderma granarium surveys have been carried out in Dodoma, Dar es Salaam, Kisumu, Kendu Bay, Homa Bay, Mohoro Bay, Taveta, Voi and Lamu. *Trogoderma granarium* infestations were confined to Tanganyika.

Insecticide trials have shown that 0·04 per cent Lindane dust at 8 oz./200 lb. admixed with sorghum and maize gave virtually no protection against weevil at the Coast. Malathion dust applied externally and admixed with maize at approximately 10 p.p.m. gave a complete control for one year. Malathion 2 per cent dust at 8 p.p.m. in sorghum stored in a silo gave virtually complete protection for eight months.

A Malathion 25 per cent wettable powder formulation gave control of *Tribolium castaneum* at 14 oz. per 1½ gallons of water per 1,000 sq. ft. when applied every three weeks for six months after fumigation. The possibilities of contamination of the grain at this level of application is high. Trials to determine Malathion and Lindane × DDT insecticide contamination in maize have also been carried out.

In the Coast Province, trials with cotton showed that the expense and extra trouble of spraying, compared with dusting, was not justified by the increase in yield.

The standard dust of 3 per cent gamma BHC/10 per cent DDT gave increased yield and higher grade cotton than 5 per cent crude BHC 10 per cent DDT. A high degree of pest control increased the cotton crop by 69 per cent at Msabaha.

Work at Kibos on the biology of stainers provided further evidence on the role of sorghum as an alternate host, carrying over adult stainers from the long rains generations on wild Malvales to the cotton crop in July. Studies on Tachinid parasites showed that the population of adult stainers bearing parasite eggs increased from 6·5 per cent in later March to 90 per cent in mid-May on wild Malvales. Parasitism in sorghum in June was about 20 per cent, and in the cotton crop fell from 35 per cent in July to under 5 per cent in October and November.

Insecticide studies on cotton showed that 3: 5: 0 cotton dust was as good as 3: 10: 0 in insect control, but 3: 2½: 0 was not so effective. On district plots 60 lb./acre of 3: 10: 0 was found to be as effective as 80 lb./acre; dusting beginning 10 weeks after planting gave better yields than that begun 14 weeks after planting. Preliminary observations indicate that Sevin is as effective as DDT BHC against the major pests. In Elgon Nyanza, DDT spraying again gave good control of Lygus, Helopeltis and bollworm attack.

On coffee, improved cultural practices and soil treatment with Dieldrin greatly reduced the incidence of the root scale, *Saissetia coffeae*, in Kisii nurseries. The recommended dipping in 5 per cent white oil was not performed at seedling issue. *Hypothenemus* (*Stephanoderes*) *hampei* on Robusta coffee in Ukwala was controlled by BHC sprays. *Epicampoptera andersoni* at Sotik was controlled by DDT after the failure of Malathion.

Work was also carried out on the biological control of prickly pear, Lantana and Striga, and on the pests of cereals, citrus, tea and stored products.

Attacks by Barley Fly were recorded in several areas where seed barley had either not been treated or had been treated inadequately. In at least two cases, Aldrin applied at a rate of 4·8 oz. actual per 100 lb. seed failed to give any control, and this treatment must be regarded as finally disproved. In experiments, dieldrin and Heptachlor again gave an efficient control. Laboratory tests on newly hatched larvae of *Nematocerus* indicated a wide tolerance of insecticides with only BHC and Baytex showing promise. A field trial at the end of the year gave encouraging results but was hampered by a considerable phytotoxic effect when y BHC formulations were applied to seed.

Adults, which occurred in many areas throughout the Rift Valley Province were readily controlled with DDT or y BHC sprays, with DDT dusts, and with a BHC/Bran bait. An attack of Dusty Ground Beetle occurred on a large scale at Naro Moru in October and was controlled reasonably successfully by aerial sprays of DDT. A y BHC or y BHC/pyrethrum marc bait was also used and was probably more efficient than the DDT spray.

Sprays of DDT and Metasystex have continued to give an effective control of Pyrethrum Leaf Thrips when applied properly. The chief problem in control is to educate growers in the recognition of an attack and in applying the spray efficiently.

Pyrethrum Flower Thrips has occurred earlier than usual and has caused considerable losses in seed production as well as possibly affecting yields of flowers. An experiment has shown Dieldrin applied at rates of 3·6 oz. and 7·2 oz. actual per acre to give a 95 per cent reduction in populations.

The reported incidence of Chafer grub is increasing in the Trans Nzoia. An observation trial conducted by the A.O. (Experiments) Kitale has given some promise of an economic control.

Incidence of Stalk borer remains low due to the use of effective control measures on European farms.

Plant Breeding

Wheat.—47 wheat varieties have been released in Kenya over the past ten years. It has been estimated that 70 per cent of the 1960 planted acreage was covered by varieties released in the last four years. This underlines the short life of most varieties and the way in which new varieties have had to be put out in a constant stream to keep the crop going. Stem rust was late to develop in 1960 and as a result wheat in the middle and lower ranges of altitude largely escaped serious attack, but when it did flare up, attacks were both widespread and severe. International races 40 and 189 have been dominant in 1960. Their virulence is such that they can attack most of our commercial varieties and this has been demonstrated in the higher altitudes in 1960. The Bird varieties had been widely adopted for these areas this season and had a high yield potential having averaged seven bags in 1959 with yields up to 12 bags quite common. Now their average yield for 1960 may be only half this figure and many fields yielded nothing. From their position at the top of the table of varieties the Birds now drop to minor varieties for the very highest districts only.

Considerable increases in the volume of breeding material on hand were effected in 1960. Material from Chile, Colombia, Mexico and the U.S.A. is being worked over as well as material from the Plant Breeding Institute at Cambridge. The backcrossing programme has indicated a preponderance of susceptible plants and has resulted in a lack of confidence in the material.

New releases due at the time of writing this report comprise six varieties for altitude ranges 6,000 feet to 8,500 feet.

Maize.—The basic breeding plan producing both hybrids and synthetics continued at Kitale, Endebess and Kakamega. Bulking of Kitale Synthetic II has given good yields on four farms growing 100 acres each and demand for seed is expected to exceed supply. In North Nyanza variable results have been achieved depending on the standard of farming. Where this has been poor the local seed has proved superior. The picture emerging is that Kitale Synthetic II is an improved variety capable of yielding better under good fertility and generous fertilizer application but that under poor conditions it cannot be recommended. At Machakos the quick variety Taboran is proving its worth. For the dry areas the greater reliability of yield of Taboran over the local White has been established and at Katumani an advantage can be expected from the former in five or six seasons out of ten. There appears to be a considerable indirect advantage due to the effect on subsequent crops. At Katumani Taboran planted in the November rains will be harvested in time for a further planting in early March; with the local White this is not possible and a reduction in yield of the long rains crops is to be expected. Trials have also shown that Taboran exhausts the soil moisture to a lesser extent than Local White and this can have a big effect on the yield of the subsequent crop.

The sorghum/maize reliability of yield comparison has been transferred to Makueni which is better suited ecologically to sorghum than Katumani. Using the short-term sorghum TADA and Taboran maize and protecting the sorghum from bird damage the big potential advantage of sorghum over maize in such areas has been demonstrated. In two poor rainy seasons TADA has given yields of 1,211 and 1,948 lb. per acre compared with Taboran maize yields of 419 and 1,175 lb. per acre respectively.

The use of stock resistant to *Puccinia polysora* was continued in the Shimba Hills area and a further supply of pure seed is being multiplied at the Tana Irrigation Scheme at Galole.

Soil and Agricultural Chemistry

Six thousand, four hundred and twenty-six samples were analysed or examined by the Chemistry Section in 1960. The bulk of these were soil samples, of which 3,884 were from farmers for advisory purposes.

Soil Survey.—Soil survey work continued in the Nakuru area where a further 60,000 acres were surveyed bringing the completed total in this area to 140,000 acres. The report on this survey is in the draft stage. In addition a soil survey was undertaken in the Nanyuki district in collaboration with the Ministry of Works, Hydraulic Branch, to select soils for potential irrigation development. About 320,000 acres were surveyed, of which 25,000 acres have been selected as suitable for irrigation. The soil map of the area has been completed and the soil survey report is in preparation.

Lime Trials.—The long-term lime application investigations which started in 1953 were continued. The three sites are still under grass and reapplication of liming materials was made at Marindas. Grass samples from Marindas were analysed and showed increases in calcium, phosphorus and potassium content as result of lime and fertilizer application. Results from Kinangop and Eldoret sites showed significant yield responses to both lime and the nitrogen potash mixture but no response to superphosphate.

Pot Tests and Trace Elements.—The completion of the new greenhouse greatly facilitated the pot test work after initial difficulties over light intensity and temperature had been overcome. Seventy-seven samples of soil were tested by the Webb-Hewitt pot technique using tomato plants as indicators. A large proportion of this number came from the continued investigation of the extent of the copper-deficient soils in the Nakuru area. A tentative boundary of these soils has now been drawn and it appears that all the ash and pumice soils round the Menengai crater and westwards are deficient. The Ando-like soils round Njoro are deficient but not the dark brown loams on the higher ground, though similar soils between Elburgon and Rongai are affected. North

of the pumice soils there is a narrow belt of latosols, running to the east of Molo River, which appears deficient though similar soils further north and west did not give responses. The soils were also analysed for "available" copper by the Aspergillus Niger fungus technique, and values for available copper in the range 0·3 to 11·0 parts per million were found, with the majority having a value below 2 p.p.m. which is the level most commonly regarded as approximating to the threshold deficiency level in other parts of the world. Generally the aspergillus findings agreed well with the pot test but there were some cases of low copper by aspergillus where no response to copper was observed in the pot test. In addition to the survey for copper deficiency, an experiment on the effect of copper sulphate application to wheat on three of the major soil types in the area was carried out. There was response to copper in all three cases. Copper increased tillering, yield and resistance to drought. Maximum yield in the first harvest corresponded to application of 40 lb./acre copper sulphate but after three crops the 10 lb. applications was yielding as well as any other. Five cases of suspected trace element deficiency in crops were examined by the pot test method, none were confirmed. The appearance of the crops was always later confirmed as due to a major element deficiency. The possibility of a trace element deficiency causing poor legume performance at the irrigation scheme at Galole was investigated by the pot test method. Deficiency symptoms akin to zinc deficiency were observed and were supported by analytical findings of less than 1 p.p.m. available zinc in the soil. Further investigation is to be carried out.

Crop Quality.—The investigation into wheat protein composition in relation to dough strength was continued. The sponge-rubber block medium for electrophoretic fractionation of gluten failed to live up to early expectations and the medium was abandoned. Electrophoresis on a cation exchange form of paper is now being investigated but difficulty has been encountered in finding a suitable dye for satisfactory quantitative scanning of the electrophorogram, and modification of the groups on the paper is being explored to enable the use of conventional dyes. Preliminary experiments on iron exchange column methods of fractionation and starch gel electrophoresis have been carried out and the arrival of new apparatus is awaited before carrying these further. The wheat maturation trial at Ol Joro Orok was continued and weekly samples were taken over a period of six weeks starting three weeks before the estimated ripe stage, and examined in collaboration with Unga Ltd. The best results were given by the third harvest which was one week before ripeness. Variation of protein content throughout the sampling period gave a pattern which started high, rose slightly, and afterwards decreased by about 1 per cent, this behaviour closely resembling that in the previous year. Dough strength increased to a maximum in the third harvest and then fell off but its terminal value differed from the maximum, by an amount not normally considered significant. Dough strength values showed considerably less fluctuation than in the previous year and the sharp drop in dough strength after ripening was not repeated.

Samples of geranium oil were distilled from a series of harvests from a time of harvesting-quality trial at Upper Kiambu and the oils were despatched to the Tropical Products Institute for quality assessment. In this investigation a pronounced fall in yield was noted at the fifth harvest (when the plants were flowering), the stage at which harvesting would normally be undertaken.

Ten samples of local citrus juice were prepared and despatched to Messrs. Schweppes Ltd. for testing.

Soil Physics.—The establishment of a soil physics laboratory was commenced in the latter part of the year under the direction of an American soil physicist under the auspices of the International Co-operation Administration. Besides the installation of pressure plate and pressure membrane apparatus for laboratory soil moisture testing a start was made in designing and laying out water consumption experiments on sugar cane in the Kano Plains area.

Fertilizer Trials.—The usual programme of fertilizer trials was maintained and results from African areas over a period were summarized and reported in papers in agricultural journals.

Irrigation

Mwea.—The rice variety collection was maintained and experiments on the fertilizer requirements and spacing of rice carried out. In fertilizer experiments on the variety Sindano responses were found to applications of sulphate of ammonia, superphosphate and farmyard manure. Field scale trials of direct sowing were continued and rotary cultivation of wet fields adopted as standard practice.

On the red soils area of the station work continued on possible irrigated crops for the red soils. The most promising to date are onions, coffee and melons.

Perkerra.—Following the success of the first crop of Bombay Red onions on tenants' holdings experimental work on this crop was stepped up. Information is being sought on the water and fertilizer requirements of the crop. Comparisons are also being made between planting of seedlings and setts. The control of nut grass and thrips is being investigated and information is being sought on the suitability of the heavier soils in the area for onion production. Harvesting and curing techniques are also being looked into with a view to avoiding excessive damage during transit. Work continued on chillies, bananas, citrus, dates and short season maize. New varieties of dates were obtained from the Sudan and added to the existing collection of Californian varieties.

Galole.—The future of this scheme is uncertain but work continued on cotton and the Ilonga variety proved superior to UK 51 and UK 58. Significant increases in yield were obtained from early plantings in April. A supply of pure seed of the stock of maize resistant to *Puccinia polysora* is being multiplied. The collection of date varieties has been maintained.

Agricultural Machinery Research and Development

(*Agricultural Officer* (*Engineering*), *Nakuru*)

Trials.—Further trials of the Bell decorticator were carried out at Mwea Tebere and it was found that the wear was excessive with abrasive soils and output was low. Trials of a Landmaster tractor at Machakos on hard ground showed that it was capable of cultivating to a reasonable depth but that the tilth produced was too fine. Attempts made to dry sisal in wad boxes showed that the sisal packed so tightly that the airflow tended to be uneven and mainly round the edges between the sisal and the box.

Experimental Equipment.—Two pairs of corrugated rollers for sisal decorticating were constructed and preliminary trials conducted. The rollers were then loaned to East African Sisal Estates Ltd. for trials with their own machine. A diablo roller to compact ridges for onion growing at Perkerra was constructed but it was not finished in time for field trials.

Sisal.—Investigations were made into the possibility of using either solar heat, or methane gas as a substitute for oil fuel in driers, or alternatively using waste heat from gas turbines used to power the factory. All methods showed a saving over normal oil fired driers but would require very heavy capital expenditure. Alternative systems of leaf transport were studied.

Coffee.—Two types of vibrating screen for shaking water off coffee (parchment) from the washing channel were tried. The most promising was a rotary eccentric vibrator with a tensioned wire mesh screen. This vibrating screen was then used to feed a cascade drier using hot or cold air to complete the skin drying.

General.—Investigations continued into the type of machinery most suited to African agriculture including ox-drawn and motorized cultivators. Attention was given to the drying of copra, chillies and pyrethrum on a small farm scale.

Agricultural Machinery Testing

The East African Testing Unit based at Nakuru continued its work in the three East African Territories, keeping in touch with the Tanganyika Agricultural Machinery Testing Unit, Special Developments Section, Uganda Government, the Agricultural Engineer of Kenya Government and numerous Research stations in the three territories. Staff was limited to 60 per cent of establishment until late in the year when all vacancies were filled by local recruitment and the position now is:—

(*a*) Officers 3

(*b*) Technical Assistants 2

(*c*) Minor Employees 7

During the year a further £1,495 was collected in test fees but £850 of this was for work completed before 1st January, 1960.

Before the end of the year the Unit was already booked up for tests in 1961 and was in fact, refusing test entries as the Organization's future is at present undecided.

The year's work was as follows:—

1. *Farm Trials.*—The five tractors concerned in the trial were farmer-owned and situated one each in Tanganyika and Uganda and three in Kenya. The trial has progressed satisfactorily with much information coming to light, it will be completed in 1961.

2. *Altitude Investigations.*—One test was concluded and the report was much appreciated by the manufacturer. It is hoped that the report will be published for general circulation in the near future.

3. *Standard Altitude Tests.*—Two tractors have been tested and both reports agreed for publication.

4. *Uganda.*—The trials of four different makes of tractors at Serere Research Station have been concluded and the report was under preparation at the end of the year. Work was also carried out on a two-wheeled tractor in co-operation with Special Developments section but the test was not completed by the end of the year. The tractor which was specially modified for the Department's ploughing scheme operated very well and in co-operation with the Special Developments Section the work was written up and published in the *Journal of Agricultural Engineering*.

5. *Drier Tests.*—Three pyrethrum driers were tested which involved some research work on the problem of drying pyrethrum. Two test reports and one "record of work" was published. A grain drier was also tested and the report has been agreed for publication.

6. *Series Tests.*—The series tests of various machines in light bush clearing and grassland improvement continued. As one machine involved the use of chemicals the scope of the trials was increased with co-operation of the Colonial Pesticide Research Unit. Although the individual reports on machines have been published it is still too early to write up a general paper. Much valuable information has already been gleaned.

The Series Test of five mechanized cultivators was completed and three reports have been written up and two are under preparation. At least one machine and possibly two will now be taken on further work with special emphasis on their use in African smallholdings.

7. *Forage Harvesters.*—The test of another forage harvester was started but not completed by the end of the year. This machine is claimed to have special interest for East Africa as it can be fitted with a special maize head with which it is hoped it can harvest Napier grass also. Another machine with special maize head is entered but had not arrived in 1960.

8. *National Institute of Agricultural Engineering—Tropical Cultivation Equipment.*—The trials of this equipment which are being carried out in co-operation with Tanganyika Agricultural Departmental staff in the Arusha area are to continue. The results from the year's work were very encouraging and interim reports have been passed to the National Institute of Agricultural Engineering.

9. *Mechanization of African Smallholdings.*—Considerable work has been carried out on this subject some of it in conjunction with the Departments of Agriculture in the three territories. A paper on a survey was published in the *Journal of Agricultural Engineering* and a further paper on the use of a conventional tractor in certain areas is due for publication. Facts and figures have been recorded and collected in the use of conventional tractors and motorized cultivators and some work done concerning ox ploughs and ox equipment.

10. *Other Work.*—Fuel filtration tests have continued as has the collecting of data and reporting of servicing and maintenance of tractors and equipment. An investigation into engine cooling was satisfactorily carried out for a leading British manufacturer. Although no report has been released the National Institute of Agricultural Engineering have made the information generally available.

The Unit has been called upon in an advisory capacity by the Kenya Government quite considerably during the year and has on five occasions been able to use a test machine on Government projects with beneficial results.

The Unit helped to organize the Interterritorial Mechanization subcommittee meeting and field day arranged by the Director of E.A.A.F.R.O.

The Unit is now represented on the Mechanization subcommittee on the Pyrethrum Board of Kenya and the Coffee Board of Kenya.

The Farm Economic Survey Unit

The setting up of the Farm Economic Survey Unit based at Njoro has been a notable addition to the services which the Department offers the public, and it is very pleasing to record willing co-operation of the farmers in those areas which have already been studied. The activities of the Unit are to be extended for three years. Useful results have been published on surveys carried out in the Uasin Gishu and the Trans Nzoia which tend to vindicate the system of the more highly developed farms and the advantages of a high proportion of arable. The most outstanding fact which has emerged is that a high level of output is the most important factor in profitability whether it is from livestock or crops. At present prices it would appear that continuing development will still pay dividends on the majority of farms. On the livestock side, dairy stock show the greatest returns in both areas. The survey has confirmed the importance of maize in the Trans Nzoia and of wheat in the Uasin Gishu, but alternate crops are necessary for technical reasons and it is hoped that the survey will throw light on the most profitable alternate crops. An attempt is being made to study all aspects of farming, return on capital invested, machinery and labour problems, economics of high feeding of livestock, economics of fertilizer usage and many others.

The farmers who co-operate in these surveys gain a great deal themselves, but they are also helping in the acquisition of knowledge of great benefit to all farmers. Considerable assistance has also been given by industries concerned with agricultural requisites and products, and this is greatly acknowledged.

PART III.—FIELD SERVICES

Progress in Improved Farming

European Areas

Apart from great interest in the possible sale of farms to the Settlement Board for the proposed Yeoman and Peasant Farming Schemes in the Scheduled areas, little land has changed hands during the year, although a small number of sales and leases of a speculative nature have taken place. Development on farms has virtually ceased except for those projects ensuring an immediate and foreseeable return, and where long-term development has taken place, it has been only that of the most urgent nature on comparatively new farms or on the larger estates growing high value cash crops. Farm plans were produced for forty-six farms totalling 66,736 acres but were mainly concerned in working off a backlog of existing applications. The advisory services however, have once more been fully occupied and demands have mainly been concerned with advice on obtaining maximum returns from projects likely to produce speedy returns on outlay. Development loans, administered by the Board of Agriculture (now reconstituted as the Board of Agriculture, Scheduled Areas) and approved during the year totalled £284,267. Of this total £131,284 was approved for the purchase of cattle, £37,478 for water development and £24,215 for purchase of sheep. The remainder was concerned with miscellaneous items such as pigs, fencing, dips and buildings and machinery, etc. Of these, the loans for machinery amounted to £70,316. The amount of loan money issued to farmers in the Scheduled areas now totals £1,153,034.

Asian Areas

Sugar cane is still the most important crop grown in this area and improved standards of cultivation are evident on many estates. The spread of sugar cane smut increased during the year and it is estimated that at least 10 per cent of the cane is infested, but control measures for this disease are being studied. The price of cane paid to farmers during 1960 was Sh. 47 per ton. It is interesting to note that the overall Kenya sugar production has increased by 123 per cent in the past decade, and the total Kenya production in 1960 was 29,608 long tons. Over the same period the production from Miwani Sugar Mills alone has increased from 9,285 to 21,582 tons. While the Kenya Sugar Company at Ramisi in the Coast Province produced 8,026 long tons, which is a slight decrease on the previous years. His Excellency, the Governor opened a Methylated Spirits Distillery at Miwani Sugar Mills during the year.

African Areas

Nyanza Province.—The greatest emphasis in Land Consolidation and Farm Planning has taken place in the Central Nyanza and North Nyanza districts where a marked demand for it has arisen, both from the propaganda of the Department and the example of Central Province.

In North Nyanza, the local term meaning "Exchange" has commonly replaced the word for consolidation and it is in this district that the most progress has been made. Many of the farmers who have had their interest aroused while attending the Bukura Farmers' Training Centre have formed small Exchange groups and are consolidating by exchange amongst themselves, only needing the minimum help from Government. In Central Nyanza rather greater progress has been made, particularly in the north-western areas of the district, but the most encouraging feature to mention is the report of progress in this direction on the Kano Plains where, in the past, the most opposition mainly on political grounds has been encountered.

In those areas where consolidation is progressing the demand for farm layouts has been great and threatens to outstrip the resources of the Field staff in providing adequate follow-up services. The first signs of interest are now evident in South Nyanza where it appears that the courses at the new Kisii Farmers' Training Centre are already exerting a strong influence. In Kericho where the enclosure of land progressed smoothly through the whole district some years ago, little progress in the actual farming was

evident, except amongst a few farmers. Interest has now been revived and a growing appreciation of the need of better farming practices is evident. This is due to a combination of three factors:—

(1) The Kabianga Farmers' Training Centre has been operating for a period of eighteen months;

(2) The removal of the rule banning imports of exotic breeds of cattle in the district;

(3) The introduction of tea as a cash crop.

It can be said, however, that progress in animal husbandry is slower amongst the traditional pastoralists, in whom the conservatism is strongest, than amongst the more agricultural tribes like the Kikuyu who have no preconceived ideas and seem better able to assimilate the principles of more advanced animal husbandry.

Rift Valley Province.—Great progress is evident in Marakwet, the Tugen Hills and the higher parts of West Suk, where many farmers, having consolidated and enclosed, have shown a remarkable appreciation of the importance of good mixed farming. European breeds of dairy cattle and woolled sheep have been imported, the standard of management amongst many of the farmers is high and in Marakwet there are firmly established co-operative societies marketing milk and cream. With cash crops too, there is progress, with the greatest progress being seen in pyrethrum. Cattle cleansing has been accepted in four locations. Skeletal planning was less popular in the Kessup Forest where development had been extensive, but 11,090 acres were completed in Nandi district. In West Suk the provision of funds for the mechanical work necessary was difficult and progress has been held up.

By far the most important progress is the balance which is shown in the development of new farms. There is emphasis neither on cash crops nor on livestock to the exclusion of the other and the planting of ley grasses in a well set out rotation is beginning to become customary in certain areas.

Central Province.—The impact of land consolidation has been established in this Province for longer than in any other and the progress achieved with its completion in Nyeri and Kiambu districts has continued in Embu, Meru and Fort Hall. In the latter, however, the success has not been so marked. The need for redemarcation of large areas became obvious and this paved the way for political agitators and the unemployed landless to stir up trouble. Despite this, there has been progress in Fort Hall. In Meru, land consolidation proceeds slowly and more emphasis has been obvious on the model settlement schemes.

Very great progress has been seen in the introduction of grade European cattle, mostly Guernseys. One farmer has a cow officially recorded in Kiambu district and four others of a very similar standard. Grass ley planting has increased. Hay making is increasing and some farmers are now very proficient in the use of the European scythe.

Farm mechanization, under very capable guidance, has progressed in Kiambu where the African District Council has been encouraged to sponsor the support, by loans, of owner-operators of tractors who engage in trade as contractors. The scheme now operates four tractors and is commercially successful. Each man can earn up to Sh. 4,000 to 5,000 per year.

A satisfactory increase in the use of fertilizers in coffee and pyrethrum is reported everywhere and the use of tonic and combined pesticide/fungicide sprays in coffee is greatly on the increase.

Southern Province.—The generally dry conditions prevailing throughout the year combined with the political excitement starting in February and gradually mounting as the elections drew near, to stifle interest in better farming. In Kangundo, Masailand, parts of Matingulu, Iveti and Nzani progress was steadily continued, but elsewhere it was only when the effects of the drought forced the population to think of the earning of a livelihood.

The Masai elders in Kajiado district have begun to show interest in more progressive farming and blocks of high potential land have been issued to would-be Masai farmers. In the Ngong area some 1,200 acres have been allocated to twenty selected farmers while ground survey work continues at Loitokitok for skeletal planning and settlement. The need for field staff to follow-up this promising development is expected to become obvious very shortly if further progress is to be achieved. The establishment of small acreages of coffee and pyrethrum is at present taking up the full time of the staff available.

In Machakos and Kitui some interest has been shown in improved cattle with the import of Sahiwals and seven Swaziland dips have been built.

In Machakos fifty-two farmers have planted silage crops in anticipation of obtaining Sahiwals and grade cattle in 1961. In Kitui the B2 Yatta Sahiwal stud scheme is increasing in popularity and eighty-six cows have returned to the district with their first cross progeny.

Coast Province.—The large 1959 cotton crop obtained good prices and gave the farmers in Malindi subdistrict such a feeling of wealth that very little effort was put into the preparation of land for the 1960 crop. This was planted late and there was little progress in any form of farming. The uncertainty of the future of the Coastal strip has much to do with the lack of progress.

In Kilifi and Kwale districts some progress is being achieved through Bush Schools and Communal Self-help groups. A start has been made in mechanization by the Kwale African District Council buying a tractor for contract ploughing. Some contract ploughing has also been done in Kilifi district where farmers are willing to pay up to Sh. 55 per acre for ploughing.

The main progress is shown in Taveta district where 126 farms were planned during the year and quite a lot of partial consolidation has been achieved. This has been followed up by survey and farm planning. With the aid of the Veterinary Department a few of the more progressive farmers have introduced grade Jersey cattle on a stall feed basis.

The statistics of improved farming are given below:—

STATISTICS OF IMPROVED FARMING

Enclosure	*No. of Farms* 1960	*Acreage* 1960
Nyanza Province	28,343	383,141
Central Province	25,250	362,960
Rift Valley Province	31,174	153,600
Southern Province	2,110	80,142
Coast Province	368	6,645
	87,245	986,488
Land Consolidation—		
Nyanza Province	8,925	76,849
Central Province	226,972	1,133,970
Rift Valley Province	1,067	36,340
Southern Province	—	—
Coast Province	855	4,576
	237,819	1,251,735

STATISTICS OF IMPROVED FARMING—(*Contd.*)

Enclosure	*No. of Farms* 1960	*Acreage* 1960
Demarcation of Farms—		
Nyanza Province	16,528	409,237
Central Province	158,186	902,290
Rift Valley Province	3,232	77,217
Southern Province	46	3,063
Coast Province	855	4,576
	178,847	1,396,383
Farm Layout—		
Nyanza Province	6,187	7,571
Central Province	18,287	88,965
Rift Valley Province	139	—
Coast Province	—	—
	24,257	100,553
Farm Plans—		
Nyanza Province	1,062	31,400
Central Province	2,115	23,240
Rift Valley Province	202	7,679
Southern Province	5	300
Coast Province	690	12,795
	4,074	75,414

Reconditioning, Resettlement and Development Schemes

NYANZA PROVINCE

Lambwe Valley.—The total number of settlers rose by eighty-nine to 533 during the year. A few plot holders have made an effort to develop their holdings, but the great majority of settlers seem to be quite content to exist on a subsistence basis with a very small cash income.

Kimulot.—Is now being administered as a part of Kericho district and will be absorbed into the Kipsigis Native Land unit as soon as the present rechecking of boundaries and the issue of titles has been completed. The tea cultivation is increasing but little development in other branches of farming is evident.

Itembe.—The layout of farms in the settlement has been completed and there is a demand now for fodder crops and better grazing. This is a progressive settlement and it has been greatly helped by the Cream Schemes which brought in £5,000 during the year.

Esherere.—This settlement, catering for North Nyanza, shows little progress. Settlers are unwilling to work to develop and continually ask for Government loans with no farming basis on which to build. Attempts are being made to establish a sound farming basis and to instil an interest in the farmers and a desire to work.

Kibos–Awach.—This scheme was completed in June and a survey of the area has confirmed the success of the scheme. Further work has been started in the neighbouring areas of the Lusavi-savi Valley and Viratze–Waraya, the former with the help of detainee labour, for which a camp has been established, bench terraces have been prepared and a sisal nursery established. Stone walling and cut-off drains have been

constructed on land of over 20 per cent slope and a farm layout team has started on a survey of the five blocks preparatory to resettlement. The area has been photographed aerially.

Sakwa.—Detainee labour has been used to clear-fell a two mile wide strip across the Utonga Peninsular to cut off the tsetse breeding area and allow settlement in Sakwa in Central Nyanza. In order to make it more attractive small dams are being built on the fringe of the area.

Central Province

Meru Settlement Schemes.—The establishment of active agricultural committees has greatly assisted the administration of the schemes by disseminating technical information. In the Kimbo–Kibericha scheme and its two adjuncts the Kirua settlement scheme and the Maari exotic stock are in high demand. Milk despite the increased supply, still commands a price of Sh. 3/50 per gallon. Cash crops are being extended.

Five other settlement schemes at Ruiri/Mchoriboro, Mutimtu, Thiura/Nkabini, Giaki and Gaitu are progressing slowly. The latter two have been aided by the establishment of an agricultural and veterinary committee. The local people in the Mbian area have decided against settlement.

Embu.—Progress on the Embu settlement schemes has been very little due to the dry conditions. Development of beef grazing would be more profitable.

Kanja Dairy Scheme.—This scheme has been abandoned and the land reallocated to the Waembu.

Ishiara.—The lack of effort and interest in the settlers is ruining the scheme. All efforts to arouse interest have failed.

Southern Province

Grazing Schemes.—Both the Machakos and the B2 Yatta Grazing schemes have increased their stocking, but opposition to the payment of grazing fees was strong in the first half year in Machakos and was only overcome after several prosecutions had been made.

The Athi–Tiva Grazing Scheme.—Remains in financial difficulties due to lack of support. This is in spite of lack of grazing elsewhere and the fact that Government experimental cattle have done well on the scheme. The lower Makueni and Makindu grazing areas were closed during the year.

Simba–Emali Ranch.—Purchases by the ranch from the district dropped to only 1,100 head, less than half of the previous year. The ranch is now fully stocked and will be unable to purchase more stock until the present holding can be sold. In order to increase the economic return from the ranch and to obtain funds with which to accomplish essential development, this stock will have to be held longer on the ranch.

Makueni Settlement.—The settlers have made good progress in bush clearing to the extent of 12,200 acres slashed and 9,766 acres stumped. In spite of the dry year, most of the settlers harvested some maize, millet, beans. The standards of husbandry are improving, but a certain amount of over-grazing has had to be remedied by opening 15,000 acres in the forward areas in September and allowing the settlers to graze their cattle there at their own risk. Two cattle sales were arranged. These were poorly supported and only 174 head were sold.

Coast Province

Gede Settlement Scheme.—This scheme, now administered as an extra location in the district has 568 settlers with applicants for 14 more plots still awaiting allocation. Refusal to pay fees in the early part of the year was overcome by the end of the year when the number of unpaid fees had been reduced to a mere handful.

Shimba Hills.—The low number of new settlers has been augmented by recruiting visits of the Advisory committee to Machakos and Nandi districts, combined with publicity in the Press and the Radio. The total number of settlers rose from 151 to 213 during the year and there are 38 new applicants outstanding. There are 288 farms demarcated for new settlers. The following additional cash crops were planted:—

Sugar Cane	110 acres (for sale to Ramisi).
Cashew Nuts	166 acres.
Coconuts	25 acres.

The food position in the Settlement has been good and self-help groups have done considerable work in bush clearing and hedge planting. The co-operative society has been restarted for the marketing of dried produce only. The Advisory Committee referred to above was started by the Agricultural Officer during the year resulting in improved relations between the settlers and the administration of the scheme. Seven miles of new roads were built, five miles of Euphobia hedges were planted and some 100 acres of Napier grass for cattle fodder was planted.

Malaria has virtually been eradicated from the scheme while the incidence of Trypanosomiasis has been reduced markedly by Berenyl and Antrycide.

Viguringani Grazing Scheme (Kwale district).—Reorganization of the scheme and the branding of all stock were done by the Administration and the Veterinary Department. Towards the end of the year, a census of all stock in the scheme was made and registers opened showing all owners and their numbers of cattle. Records of all water supplies have been made and a new map has been prepared showing on a large scale, all locational boundaries.

Rift Valley Province

West Suk.—No additions have been possible in the grazing schemes areas due to lack of money for water development. The existing schemes are working well. The following table shows areas and stocking rates:—

Riwa	56,000 acres	8·8 acres per beast.
Kipkomo ..	43,000 acres	12·4 acres per beast.
Batel	30,000 acres	10·6 acres per beast.
Chessera ..	23,000 acres	11·6 acres per beast.
Masol ..	142,000 acres	79·0 acres per beast.

Baringo District Schemes.—Further mechanized soil conservation work has been carried out in the Lembus forest and more development of farm holdings has continued in Saos, Rosaga, Ngubretti and Kibrota. In the Ewining Triangle obstruction towards planning and boundary adjustment was encountered but the people show signs of agreeing to collect money for water development.

In the Kamigoi and Chemogoch schemes ground control for aerial photography is complete. Planning maps from aerial photographs have been obtained for the Esageri grazing scheme. In the former two schemes good progress has been made, both in farm planning and its application on the ground by farmers.

Grazing has become very short on the Gobat, Perkerra, Cheberen, Radad, Kerio catchment and Solai border grazing schemes, but more water holes have been built and the cutting of traces to obtain better grazing control has proceeded.

In the Murgurin area poaching was considerable for the first nine months of the year. This situation has been controlled to some extent, one water hole has been completed and three more are being built. Reseeding, trace cutting and the making of tracks have progressed.

Sarora Settlement (Nandi district).—Forty of the two hundred settlers are showing good progress. The rest continue to prove themselves impermeable to progressive ideas but some rejuvenation of old coffee has been successful and a commercial dairy where milk is separated for ghee making has been introduced.

Income from sales was:—

	£
Coffee	222
Ghee	160
Maize	1,130
Sunflower	60
Beans	60
	1,832

This gives an average cash income of £90 per settler and the better farmers are obviously making much more.

Kaimosi Settlement (Nandi district).—One hundred and eighty-one plots have now been settled. Livestock improvement progress is in hand with the establishment of leys and fodder. The sale of ghee is estimated at £275. New settlers exhibit the most progress and among them the ex-squatters show up best.

Olengurone Settlement (Nakuru district).—The number of settlers is now 272 and 30 new plots are ready for demarcation. The importance of pyrethrum as a cash crop is now established and 60 acres have been planted. Cattle husbandry is improving.

Soil and Water Conservation

The advisory and mechanical services of the Soil Conservation Service continued to operate, although the service as a whole received a severe setback due to the feeling of uncertainty existing among European farmers and as a result a great number of orders for work were cancelled. This shortage of work was largely offset by increased demands from the African areas for soil conservation work and dam construction. A special unit was formed to construct dams in South Nyanza and the results there have proved highly satisfactory. Most of the machinery from the disbanded Dam Construction Unit at Machakos was transferred to Nakuru for integration with the existing Soil Conservation Unit.

The general outlook for the Soil Conservation Service is promising due to the imminence of settlement by African farmers in the scheduled areas and the need remains for the services of the farm planning teams and also for the machinery to carry out the necessary work.

Soil Conservation—European Areas

Terracing district figures are given below and further figures are given in Table E.

District	1941–57	1958	1959	1960	Total
Trans Nzoia	63,251	2,465	1,384	2,466	69,566
Uasin Gishu	69,744	16,272*	12,568	15,113†	113,697
Nakuru	70,331	2,627	2,991‡	1,314	76,663
Thomson's Falls ..	54,752	4,869	5,028	1,824	66,473
South Kinangop ..	18,468	5,656	5,280	2,887	32,291
Nyanza	10,232	979	234	597	12,042
Nairobi	5,930	685	185	204	7,003
	282,476	32,952	27,670	24,405	379,735

*Includes 12,500 acres cut-offs in Elgeyo and Nandi.

†Includes 7,300 acres in Elgeyo and Nandi.

‡Includes 357 acres in Baringo.

Permanent Crops.—Work on tea, coffee and sisal estates in the Nyanza and Nairobi plantation areas continued. The acreage known to be protected by various soil conservation methods is given in the table below:—

SOIL CONSERVATION IN PERMANENT CROPS (ACRES)

	Up to 1959	1960	Total
Sisal	13,019	1,500	14,519
Tea	6,506	72	6,578
Coffee	2,496	234	2,730
	22,021	1,806	23,827

This figure is the known area of soil conservation in permanent crops, however, much work of this nature is now carried out privately and the tea area, for instance, is probably well in excess of the figure shown.

Farm Planning.—The demand for this service fell during the year. Particulars of work done are given below:—

FARM PLANNING, 1960

DISTRICT	Farms Surveyed and Mapped		Farms Planned		Total Planned 1951–60
	No.	*Acres*	*No.*	*Acres*	
Uasin Gishu	14	15,154	12	15,958	90,461
Trans Nzoia	15	18,742	14	20,791	62,023
Thomson's Falls ..	10	15,146	9	21,441	66,719
South Kinangop ..	5	7,924	—	—	—
Nyanza	2	7,807	—	—	6,345
Nairobi	2	185	1	120	11,493
Nakuru	12	15,942	10	8,426	100,556
	60	80,900	46	66,736	337,597

TABLE E.—SOIL CONSERVATION SERVICE

(*Output of Terracing, etc., for the Year* 1960)

DISTRICT	No. of Farms Treated by Tractor	ACREAGE PROTECTED BY				Total
		Broad Base and "V" Terraces	Diversion Ditches	Narrow Base Terraces	Bench Terraces	
Trans Nzoia ..	42	340	2,126	—	—	2,466
Uasin Gishu ..	123	551	14,562	—	—	15,113
Nakuru	21	393	1,518	—	—	1,911
Thomson's Falls ..	18	—	1,824	—	—	1,824
South Kinangop ..	28	392	2,495	—	—	2,887
Nairobi	5	202	—	—	2·5	204·5
	237	1,878	22,525	—	2·5	24,405·5

The Nakuru unit figures cover the Lumbwa area, where eight farms were treated by tractor and 542 acres were protected by "V" terraces and three acres by diversion ditches.

COMPLEMENTARY WORKS, 1960

DISTRICTS	Roads	Excavation	Training Bank	Outlet Drain	Cut-off Drains
	Yds.	*cu. yds.*	*Yds.*	*Yds.*	*Yds.*
Trans Nzoia	47,353	1,350	2,100	26,063	9,653
Uasin Gishu	138,990	209,490	16,150	4,100	12,088
Nakuru	174,871	—	500	14,693	36,593
Thomson's Falls ..	20,276	2,486	857	2,476	27,124
South Kinangop ..	10,594	32,000	2,880	2,756	—
Nairobi	10,770	14,010	—	3,076	320
	402,854	259,336	22,487	53,164	85,778

Work in the Lumbwa area was carried out by the unit from Nakuru and included 816,113 yards of roads and 1,526 yards of cut-off drains.

Land Preservation Orders.—The Director of Agriculture issued 24 orders under the Agricultural Ordinance in 1960, of which nine were to remove previous orders from the register and three to require cessation of cultivation in prescribed areas and 12 orders were removed from the register for conversion of title. In the Nairobi district, River Scouts were responsible for 930 acres of terracing on labourers' *shambas*.

SOIL CONSERVATION—AFRICAN AREAS

Nyanza Province.—Soil conservation is accepted throughout the Province, but the maintenance once the measures have been put in, is not so obvious and not so popular. This is being met by increased pressure on the farmer from the department in all districts, particularly the Lakeshore locations of Central and South Nyanza, where maintenance measures are most disregarded.

Rift Valley Province.—Progress in the reseeding of grazing schemes was nullified by the dry year but the planting of grass on dam walls was particularly successful in West Suk. This grass is now serving as a seed production source for the coming year. Narrow base terracing was continued in Baringo district and tree planting proved popular, in both Baringo and West Suk.

Central Province.—Although improvements in general farming practice such as contour planting grass leys and improved tilth have been noticeable, actual maintenance and continuance of soil conservation measures have deteriorated. This is most noticeable in the most politically minded district of Fort Hall. Here, the Agricultural staff have actually been threatened for carrying out their duties.

Southern Province.—Political activity throughout the year has led to a lack of interest in matters agricultural, in all except the 10 per cent of the population who continue to progress. This has been most noticeable in effort devoted to soil conservation. The need for Government Officers to devote much of their time to duties connected with registration of voters has made it very difficult for the necessary pressure to be maintained.

Coast Province.—Remarkably, this Province has shown most progress in the year. In Kilifi district alone, 622 miles of contouring and 6,175 grass strips were completed.

WATER CONSERVATION—MECHANICAL DAM CONSTRUCTION UNITS

The work done by the mechanical units is detailed in the table below:—

UNIT	No. of Dams and Water-holes	Earth Moved	Water Storage	Tractor Hours Worked	Mean Output per Tractor Hour
		Cu. yds.	*mil. gal.*		
Eldoret	62	116,300	23·50	1,656	76
Thomson's Falls ..	25	179,091	179·10	4,606	39
Kitale	9	20,600	9·20	601	34
Nakuru	8	21,500	9·75	582	37
Kinangop	13	70,285	64·14	1,963	37
Total	117	407,776	285·69	9,408	45

The Soil Conservation Unit, Ruiru, supervised the excavation of 28,000 cu. ft. of rock at Mrefu and 29,000 cu. ft. of rock at Kakuzi for dam construction.

WATER SUPPLIES—AFRICAN AREAS

Nyanza Province.—Medium-sized drains of one to two million gallon capacity have been built in South and Central Nyanza districts at the rate of two to three per month. Their average cost has been £600. Individual supplies are being obtained with roof catchments and wells, the former of which is becoming very popular and group supplies by dams, weirs and reticulation schemes for which the costs are raised comparatively easily by such organizations as Locational Councils. Boreholes are also being sunk in Elgon Nyanza. Twenty-six dams were built in the year. There are a number of dams in Central Nyanza which were built in the past and have failed. These are being investigated with a view to salvage as many as possible and to assess the cost involved. Recommendations for swamp usage have been made in South Nyanza.

Rift Valley Province.—Nineteen dams and water holes were constructed in the grazing scheme areas. Baringo district now has 76 of these and yet there is still room for better distribution. The protection of springs progressed markedly with 223 more being protected during the year. This brings the total to 319; developments in piped water schemes have been held up but 280 farms were supplied with water in Nandi, the 3,000-acre scheme at Kamugio (Elgeyo) was nearly completed and the Saos pipeline was extended to supply 128 new farms. In Nandi 64 wells were dug.

Central Province.—A hydrological survey is being made by the Ministry of Works in Kiambu district with a view to developing rural water supplies. There is money available for implementing the first stage of this. Recommendations have been made by ALDEV for the development of the Kabare Water scheme in Embu, the Maragua Tuso Furrow scheme in Fort Hall and the Zaina scheme in Nyeri and these will be carried out with funds already available. They are major schemes supplying piped water to villages and farms by gravity down ridges and are designed to be self-supporting from loan funds. The Liliaba pipeline in the Meru Northern Grazing area was extended into the "D" ranch.

Southern Province.—Local contributions for water development in Kitui were curtailed and the development was held up despite the availability of funds on the £ for £ basis. In spite of this, three pipeline schemes were completed and two more are nearing completion. In all 12½ miles of pipeline have been laid. In Machakos the water rates were lowered from Sh. 30 to Sh. 20. The balance is to be paid from general rates. Pipeline schemes have been constructed at Kibuani from the Malindi borehole and improvements are being made in the Makueni Farm N. Pipeline. Numerous weirs and wells have been contructed in Machakos together with 35 sub-surface dams. One earth dam was built by soil conservation machinery at Kyai in Machakos district.

Coast Province.—In Coast Province effort has been concentrated on dams. There were six new dams built and ten dams or tanks were cleared out and enlarged while the spillways and walls were repaired on three more.

Field Drainage

Five hundred acres of mole draining were successfully completed by Nakuru Soil Conservation Service unit at Londiani. There is a continuing demand for work of this nature. A small area of vlei drainage was completed in the Kitale district. Four hundred and fifty acres of land at Mitubiri were set out for drainage and sisal planting and 487 acres of land were surveyed and planned for drainage at Lari.

Irrigation

Irrigation Development Projects.—The Mwea Irrigation scheme has passed from the experimental phase and is now on a sound economic footing. The Tana and Perkerra schemes still have to be proved. The Tana scheme is reasonably certain of success if the scheme can be sufficiently expanded, but the Perkerra Irrigation scheme is severely handicapped by the indolence of the local Njemps and Tugen, by unsuitable soils and by shortage of water at critical times.

Mwea Irrigation Scheme—Development.—The year saw the completion of the major irrigation works and the change-over from development to consolidation and organization. The total of 1,392 acres were levelled and equipped with structures thus completing the development phase. By June the scheme had 4,974 acres of black soils and 130 acres of red soil under irrigation with 770 acres of irrigable red soil to which water had not been supplied. The rest of the year saw the completion by prison labour of most of the minor jobs which had not been completed in the rush to finish development before the end of the financial year in June. A total of 337 double houses were built to accommodate settlers and water-borne sanitation for 460 seats was completed.

Settlement.—There were 423 new tenancies allocated in the year, bringing the total to 1,244 settlers. Of these 568 were Embu from the district, 410 Kikuyu from Kiambu, 174 Kikuyu from Nyeri and 92 Kikuyu from Fort Hall. Of these the Tebere section carries 587 and the Nguka section 657. Four tenants had to be evicted and four deserted but their places were quickly filled by new tenants (for which the demand is still strong). A Tenants Liaison Committee and a Central Advisory Committee were constituted and both of these bodies have worked well to improve understanding between the tenants and the management. A most encouraging feature was that the tenancy agreements and rules were signed willingly and without incident in the face of political advice not to co-operate. In the Tebere section where continuity of staff has been very broken, the discipline is not so good as that at Nguka.

Crops.—The Nguka works were completed too late for new tenants to have the full benefit of the long rains, but the overall yields have improved. Indications are that the third year of cropping is better than the first two, but much of this may be due to the greater experience of the cultivators. The 3,281 acres planted to rice and harvested in January and February, yielded an average of 24·31 bags per acre giving tenants an average cash income of £130. The system of having one-acre nursery plots of rice for four tenants has had to be abandoned on account of the difficulties of water control and the limitations of the cultivators.

The total area planted in 1960 was 4,409 acres, but the average yield is expected to be reduced due to the tendency of the farmers to let matters drift following the very good cash return from the previous harvest.

Storage space has been more than doubled so that 52,000 bags of paddy can be stored at a time, and the area of drying floors has been increased to 1¾ acres. Leaf miner has been fairly extensive at Nguka and grasshoppers have damaged nurseries in Block 11. Hippopotami have also done some damage in young rice planted near the Thiba River.

Experiments and Trials.—Thirteen extension trials were laid down in the rice growing area and a number of observation trials on the red soils on Unit 11 were reaped early this year. These were:—

A 2½-acre onion trial yielded an average of 2·46 tons per acre and would give a gross cash return of £99 per acre.

The early onset of the long rains prevented the tomatoes from giving good results. Yields were limited to 4–5 tons per acre.

Twenty-seven acres of Hibiscus sown in 1959 were reaped in February and March. The Nigerian varieties averaged 444 lb. and the Sudan varieties 233 lb. per acre. The ribboner tangled much of the fibre due to difficulties in the removal of all pith. This resulted in high retting losses. The final yields showed a loss of Sh. 195 and Sh. 313 per acre and no further trials have been planted. Five pilot holdings of two acres each were laid out on the irrigated red soils. On these coffee, onions, and cabbages will be grown leaving a small area for subsistence crops.

General.—A great deal of consolidation has been effected, following the final development. The new developments in relationships give more hope for the future than the soundest achievements. The progressively better yields and the fact that the scheme has proved itself as an economic undertaking, enhance the future prospects.

The office is now in contact with the outside world by telephone. More weighing facilities have been installed at both centres and the headquarters buildings are now completely fenced. The storage facilities for all stores have been rationalized, a proper lumber rack has been built and the M.T. yard and fuel stores have been rationalized.

The year has been the driest on record but water supplies were never short. Rainfall records were made at six separate sites. The mean rainfall totalled 23·10 inches with 13·13 inches in the long rains and 8·57 inches in the short rains. January, February and June to September all received less than one inch per month. Rain grown food crops accordingly largely failed.

Perkerra Irrigation Scheme

Development.—With only two officers on the scheme it has not been possible to carry out new developments on the land. At the end of the year the Ministry of Works surveyed the area, with a view to estimating the cost of bringing the developed light soil area, the total light soil areas and the whole scheme, including the heavy soils, into production.

Fencing of tenants' holdings has been started. The first trial of creosote treated cedar thinning has had to be replaced with properly matured cedar posts on account of the termite damage.

Settlement.—The number of tenants dropped from 114 at the beginning of the year to 99 at the end, but 29 potential tenants were established in June on one-acre holdings. The introduction of onions as a cash crop proved successful and renewed interest has been aroused as a result. A tenants' advisory committee functioned more or less successfully throughout the year, but the standard of tenant is still very poor.

Crops.—Six acres of Kalahari Early Pearl Maize were harvested in January and yielded four bags per acre. Onion nurseries were established for both the long rains planting and the short rains crop. This gave good results and yielded valuable information on the crop. The seedlings were supplied to tenants. The settlers were at first suspicious but eight people planted reasonable areas and averaged 4·48 tons per acre. This brought an enthusiastic response from the other settlers who nearly all demanded seed to plant for the short rains. Advice was accepted willingly but lack of experience and encounters with unforeseen problems resulted in poor yields. It is felt, however, that this crop, once the difficulties have been overcome, will prove a profitable one for the scheme.

Maize was better cared for, but the standard of husbandry is still low and more attention is needed to weeding the crop to prevent competition for water at the vital period of flowering and cobbing.

Experiments and Trials.—Storage trials on onions showed that they could be kept 7½ months in store and still be marketable. The production of a suitable roller with which to produce a compacted ridge of stable shape for onion growing is being investigated.

Investigations into the control of nut grass (*Cyperus rotundus*) have been carried out. Eptam has given poor results but trials continue with placement in the ridges and the complete herbicide Cholerea.

Control of thrips in onions was a problem which had to be investigated. Didimac proved unsuccessful and Dieldrin and Malathion are to be tried.

General.—A seven-course rotation was drawn up for the scheme and is to be amended to include a large proportion of onions. The bridge over the Perkerra River is nearly complete. All tenants' cattle were branded in February and a register is in operation. Each tenant is allowed up to six full-grown animals, but the absence of grazing outside the scheme has resulted in a considerable volume of trespass.

Rainfall for the year was only 15 inches to 18 inches which is half of that which fell in 1958. The damage by game has been negligible.

Tana Irrigation Scheme

By the end of the development period, which finished in June, the target of 1,200 acres was completed. It was in fact ready for irrigation in April although there was considerable clearing up still to be done. Through lack of tenants only 432 acres were actually cultivated. Two tenants' villages were completed, together with sanitary facilities. New staff housing was also completed.

Settlement.—The number of tenants fell from 149 to 108 by April and of these 31 were volunteers who asked to stay on after release. By October the numbers rose again to 117 tenants on 473 acres.

Crops.—Twenty acres of elite seed of U.K. cotton were planted by the scheme and 432 acres of cotton were planted by tenants. The final crop averaged 1,070 lb. per acre of A Grade cotton and only 11 lb. per acre of B Grade. It is estimated that the unpicked B Grade cotton lost through the indolence of the settlers amounted to between 200 and 250 lb. per acre. The control of water for maize seems to be better appreciated and the tenants are estimated to have reaped an average of 10 bags per acre.

The Soya Beans seed was unfortunately mixed and the varying requirements of the two varieties brought in difficulties in water management and the resultant yield was only two bags per acre.

The Uplands Rice Maria planted in December, 1959, was given too much water in the early stages and should undoubtedly have yielded more than 3,334 lb. per acre which were harvested.

Onions have yielded up to 4,000 lb. per acre and tenants have planted ½ acre each of the Bombay red variety for the short rains.

Dates have fruited two years after planting but the trees which bore last year, appear not to be bearing in the present season.

The trials on rice, onions and dates are recorded above. In addition an observation plot of Turkish Tobacco appeared to grow well. It is still to be harvested. The water requirements for all these crops seem to have been largely finalized.

General.—The year has been very much in the nature of a slowing-down process with the development of the 1,200-acre pilot area completed. The doubts as to what the future of the scheme might be have aided in a general sense of uncertainty. No water shortage has been experienced which was not due to human error. The main canal was completely cleared by draglines by May and the process has been repeated continuously. All the settlers have an improved ability to irrigate and this is the key to a successful venture into irrigation.

The Tana Irrigation Committee continued to meet monthly but by June it was apparent once every two months was quite sufficient.

The workshops were completed and equipped, enabling most normal mechanical troubles to be dealt with on the scheme. Difficulties in the stores have been experienced due to not having an M.T. storekeeper.

Agricultural Education

There has been considerable expansion in this field during the year and the Farmers' Training Courses have proved extremely popular and instructive. Farm institutes are now established at twelve centres in the principal agricultural districts.

The Agricultural Training Schools at Siriba, Embu and Kaimosi continued to function providing training for agricultural instructors primarily, but also providing facilities for refresher courses for departmental staff and instructional courses for farmers.

The extensions to Siriba Training College with Rockefeller Foundation and Hindocha Trust aid in order to accommodate students studying for the diploma in agriculture, were all but completed and the assembly hall donated by the Hindocha Trust should be ready in early 1961. The diploma courses at Egerton College, Njoro, were opened to students of all races by a unanimous decision of the Board of Governors.

Agricultural Training Schools.—Agricultural instructors in training at the three Provincial Agricultural Training schools at the end of the year were as follows:—

	Siriba (Nyanza)	Embu (Central)	Kaimosi (Rift)	Total
1st year	32	—	22	54
Final year ..	25	40	16	81
Total	57	40	38	135

Siriba College.—The training of Agricultural Instructors continued and combined staffing plans for the diploma courses due to commence in January, 1961, were finalized during the year. The first intake of 20 diploma students for the diploma course was satisfactorily completed.

Embu Training School.—The status of student entry has been raised at this training school and only applicants with School Certificates are now considered. Only eight candidates with the necessary qualifications were forthcoming and it was decided that they should be transferred to Siriba for training, five candidates declined and so only three moved to Siriba. A six-week refresher course for Assistant Agricultural Instructors and a farmers' course on animal husbandry were held at the school. Plans are in hand for the construction of a Farm Institute within the school boundaries.

Kaimosi Training School.—Adult courses for farmers, tractor drivers and junior departmental officers were held and a total of 222 candidates attended the courses there.

Nyanza Province.—Bukura Farmers' Training centre was in full operation in 1960 and 1,400 farmers received training there with noticeable effect in the districts served by the centre. The Kabianga centre operated for almost a full year and the centre at Kisii was opened in the second half of the year. The Jeanes School Agricultural Wing has done admirable work during 1960 and a total of 3,681 students both male and female and from all sections of the community completed courses there.

Central Province.—At Meru, new construction proceeded to replace the out-of-date mud and wattle buildings. No courses were held there in 1960. The Wambugu Farm Institute at Nyeri provided courses for 739 farmers. In Kiambu the Waruhui Memorial Farm Institute provided farmers' courses attended by 208 men and women and in addition 58 Assistant Agricultural Instructors, attended a refresher course. Fort Hall remains without a centre at present but it is hoped that the Miriira Farm Institute may be developed in the near future.

Southern Province.—The construction of two new centres at Machakos and Kitui was initiated during the year.

Rift Valley Province.—Kaimosi Training Centre continued to provide Farmers' Training Courses and in 1961 will be concerned solely with these courses, as Agricultural Instructor training will be dealt with at Embu for first-year courses and Siriba for subsequent training.

Coast Province.—The centre at Matuga has been closed down and is being used for other purposes. However, if funds become available it is hoped to build a Farmers' Training Centre at Mtwapa.

Agricultural Education in Schools.—School gardens and agricultural education in schools was influenced by departmental staff and a general improvement in the gardens was noticed in most areas.

Young Farmers' Clubs.—It was decided that the Club Movement should come under review and be organized on standard levels and it is hoped that I.C.A. may provide a 4–H expert from U.S.A. to make a survey of existing clubs and the present organization with a view to setting up a colony-wide Young Farmers' Club movement.

The Department staged exhibits and entered for many classes in shows throughout the country among which the livestock entries were particularly successful. Field days were held at most research experimental and other departmental centres during the year. The response has been most heartening and it is obvious that this type of extension is proving worthwhile.

Marketing

Details of exports from African areas in 1960 are given in Table D. The following is a review of the marketing in the Provinces:—

Nyanza Province.—The Nyanza Province Marketing Board continued facilities for the marketing of a wide range of crops to the satisfaction of the producer. The maize crop of 768,433 bags was slightly more than that handled in the previous year, but the rice crop was 16,000 bags down. These two crops, which are handled as agencies for the Maize Marketing Board and the Kenya Government respectively, totalled £1,165,505. The Board added beans, peas and gram to the list of produce handled hitherto and the total amount of produce handled rose by 50 per cent to 202,509 bags for which producers received a total net sum of £332,573. The total intake for all crops was 927,192 bags representing a total payment to the producer of £1,262,668 to which is added the value of ghee and eggs. This gave a grand total of £1,343,018.

Propaganda through the monthly bulletins no doubt helped to increase the sales to farmers of seeds of which 2,129 bags were sold at cost. These were comprised mostly of groundnuts and rice, but also included sorghum, finger millet, gram, beans, peas and castor seed.

Fumigation and dusting had to be increased due to a heavy infestation of *Calendra oryzae* which originated in the stores of producers and dealers, particularly in the South Nyanza lakeshore areas. 364,870 bags of maize and 16,504 bags of other produce were treated at an average cost of 17·03 cents per bag.

The publicity services were greatly increased. The monthly issue of the bulletin is increasing and separate editions in Kiswahili are shortly to be introduced. Regular broadcasts in Kiswahili, Dholuo, Abuluhya and Kalenjin were augmented by addresses given at *barazas*. The visits of Farmers' Training courses and various official and unofficial groups to the Board were greatly increased.

Central Province.—Government removed the guaranteed prices and import restrictions from a wide range of beans and pulses. The Central Province Marketing Board then had to compete with low price importations from neighbouring territories and prices had to be varied accordingly for such things as Njaki (*Dolichos lablab*).

Generally, the activities of the Board have continued and expanded despite the dry weather and producers now receive a News Sheet from the Board explaining its activities. The quality of produce exported from the country has received favourable comment.

Rift Valley Province.—The marketing is not fully organized in Rift Valley Province, but Co-operative Societies have been formed for pyrethrum in West Suk and for milk in Elgeyo. There is a need to organize the marketing of potatoes, beans and vegetables. In Nandi, the services of the Nyanza Province Marketing Board are used.

Southern Province.—The unorganized flow of fruit and vegetables continued to the Nairobi market, but diminished severely towards the end of the year due to drought. The need of a thorough overhaul of the needs of the District and marketing organization is recognized and is to be helped by the appointment of a Marketing Officer early in 1961.

Coast Province.—Investigations have begun in Coast Province to try to rationalize the marketing organization on a sound basis. Exports of Malindi mangoes to U.K. have sold well. The producers throughout the Province are singularly unwilling to understand the difficulties of marketing.

Grading and Inspection Services

The Chief Grader and Inspector reports:—

Inspection.—There was a marked decrease, both in quality and in value of imports of plants and plant products as compared with the previous year. The number of packages fell from 567,094 valued at Sh. 54,225,876 in 1959 to 469,183 valued at Sh. 34,020,869 in 1960.

Imports of fresh fruit were well maintained, and there was an increase in supplies of Australian and Italian apples, although imports of grapes fell noticeably. Supplies of fresh fruit from Israel continued to develop.

There were six importations of Australian wheat, amounting to approximately 1,300 tons. All were satisfactory as regards quality and condition.

The condition and cleanliness of Egyptian garlic improved greatly and imports continued although on a smaller scale than previously.

Forty-five infestations of *Trogoderma granarium* were detected during the year. Seven were found in shipments of rice from Pakistan, two in Siamese rice and two in shipments of rice and dhal from Dar es Salaam. One infestation was found on hessian wrapped cases of dates from the Persian Gulf and on bagged coc-de-mer and sea shells from the Seychelles.

The remaining 32 were found in mixed cargoes of foods and spices from India. None was found in malt. All infestations were fumigated.

Exports of Castor seed continued to decline, amounting to 122,914 bags as compared with 131,821 in 1959. The number of bags of Kenya origin was 58,758 against 61,645 in 1959.

The demand for Phytosanitary Certificates increased and 251 were issued as compared with 112 in 1959. One hundred were for Uganda coffee, 28 for Tanganyika coffee, 25 for Kenya coffee and one for Buni. Six were for Kenya sisal. Other commodities for which certificates were issued included maize, gram, cowpeas, beans, fruit, vegetables and botanical specimens.

Grading.—The exportable surplus of Kenya maize proved to be very small and only one shipment was made. 99,644 bags of K4 white maize were graded for this consignment and 3,077 were rejected, principally for excessive insect damage.

All maize was fumigated with methyl bromide prior to loading by the Maize Marketing Board. In the case of one stock of 13,565 bags, re-infestation occurred so rapidly during the 24 hours following unsheeting ,as to necessitate re-fumigation.

Exports of ungraded maize to the Seychelles amounted to 504 bags as compared with 2,060 bags in 1959. Other shipments of ungraded maize comprised 42,864 bags to Japan, 3,909 to Venice and 3,863 to Avonmouth, all of Tanganyika origin.

The total quantity of beans submitted for grading was 56,843 bags as compared with 94,256 bags in 1959 and 54,298 in 1958. Mixed beans were again the principal feature and 25,325 bags were examined as against 26,315 in 1959. Figures for White Haricot fell from 17,266 bags in 1959 to 9,001 in 1960 and those for Canadian Wonder from 23,024 in 1959 to 11,386 in 1960. Mixed beans were exported as sixth grade but White Haricot and Canadian Wonder ranged from the third to sixth grade. South African and the Central African Federation were again the major purchasers of mixed beans. Shipments of seed beans amounted to 77,222 bags, mostly of Tanganyika origin.

The steady rise in the volume of potato exports was continued and a total of 89,685 cwt. were examined of which 3,123 were rejected. New grading rules prescribing revised grades came into effect in June, 1960. 44,520 cwt. were graded as K2 under the old rules. Under the new rules 12,310 cwt. were graded as Large, 29,602 as Medium and 130 as Seed. Principal supplying areas were Elburgon and Meru. All exports were of Kenya origin.

Small chillies were amongst the few items which increased in volume of exports as compared with the previous year from 3,368 to 5,383 bags. All were of Uganda origin and quality was again poor or indifferent. The decline in exports of capsicums continued, the total examined falling from 11,762 bags in 1959 to 7,223 in 1960. Quality of capsicums improved very markedly and almost all consignments were graded FAQ.

Inspection of Horticultural Produce for Export.—Inspection of horticultural produce continued under the old rules and under the new rules which came into effect on 3rd December, 1960. The total number of certificates issued during the year was 434, covering fresh fruit and Asian-type vegetables.

Revenue.—Revenue from grading and plant inspection fell by two-thirds, amounting to Sh. 32,984/50 as compared with Sh. 95,665/90 in 1959.

SUMMARY—PRODUCE GRADED

	Maize		Beans		Potatoes	
	Bags	*Tons*	*Bags*	*Tons*	*Cwt.*	*Tons*
K1	—	—	—	—	—	—
K2	—	—	—	—	44,520	2,226
K3	—	—	5,573	498	—	—
K4	99,644	8,897	13,986	1,249	—	—
K5	—	—	—	—	—	—
K6	—	—	37,091	3,312	—	—
KL	—	—	—	—	12,310	615
KM	—	—	—	—	29,602	1,480
KS	—	—	—	—	130	7
RJ	3,077	275	103	17	3,123	156
	102,721	9,172	56,843	5,076	89,685	4,484

	Chillies		Capsicums	
	Bags	*Tons*	*Bags*	*Tons*
GAQ	—	—	—	—
FAQ	188	7	6,489	130
UG	5,195	185	669	13
RJ	1	—	65	1
	5,384	192	7,223	144

Quelea Control and Research

General.—The most important aim of the Quelea Control and Research Unit has this year been achieved. Migratory concentrations of these birds, moving up the Rift Valley from the main Tanganyika breeding grounds have been completely controlled before they reached the crop areas. The economic "curtain" aerial spraying technique developed in Kenya in 1959 has again proved most efficient in both Kenya and Tanganyika.

Biological and ecological research has confirmed previous observations of the habits, breeding behaviour, conditions and areas necessary for the large-scale breeding of Quelea. The ringing of birds has resulted in further proof in establishing distribution, migratory trends and life span.

An estimated saving of at least £1¼ million of wheat, apart from rice and African crops of millet and sorghum, has been effected over the past five seasons.

Control.—Another breeding colony campaign was undertaken in Tanganyika during the first six months of the year. Escapes from some Central Province colonies then moved north. A number of aerial sprays and blow-ups were necessary to safeguard crops in the Northern Province of Tanganyika, losses being quite small.

Large roosts, close to the Rift wall near the Tanganyika–Kenya border were sprayed as successive migrations came in, thereby preventing approximately 11½ million Quelea from attacking Kenya crops. Six small blow-ups were also carried out accounting for just over 100,000 birds.

Forecast.—After another two or three campaigns, populations should have been so reduced to enable the species to exist in its natural habitat only necessitating routine control from time to time.

PART IV.—GENERAL

Library

It is pleasing to be able to record that owing to a most generous gift of funds from the Rockefeller Foundation it was possible this year to make real progress with building up libraries containing the basic requirements at district level and at farm institutes, as well as augmenting those on the research stations. In all some 900 volumes were added to various libraries. The following journals were added to those already taken by the Department: *World Agricultural Economics Abstracts*, and *Netherlands Journal of Agricultural Science*. Four issues of the Newsletter appeared during the year.

Publications

The following is a list of articles by departmental officers published during the year:—

Allister, P. J.—Quarterly reviews of the Central Province African Grown Tea Marketing Board's activities. *Tea*, Vol. 1 No. 3, p. 21, No. 4, p. 23, Vol. 2, No. 1, p. 17.

Allister, P. J.—Tea growing in African areas: the potential of the Meru district. *Tea: The Tea Board of Kenya Journal*, Vol. 1, No. 2, p. 20.

Bellis, E.—Sisal and soil in Kenya. *Kenya Sisal Bd. Bull.*, No. 32, p. 23, and No. 33, p. 19.

Birch, W. R.—High altitude ley agronomy in Kenya—III. The effects of lime and molybdenum and some observations on the use of legumes. *E. Afr. agric. J. 25*, 156.

Bock, K. R.—Coffee berry disease control . . . a reminder (note). *Kenya Coffee 25*, 162.

Bock, K. R.—Interim recommendations for the control of coffee leaf rust. *Kenya Coffee 25*, 372.

Bock, K. R.—Notes on the control of coffee berry disease, *Kenya Coffee 25*, 16.

Bogdan, A. V.—The breeding behaviour of molasses grass in Kenya, *E. Afr. agric. J. 26*, 49.

Bogdan, A. V.—A molasses grass variety trial. *E. Afr. agric. for. J. 26*, 132.

Bond, D. C.—Control of bean fly. *Kenya Farmer* No. 46 (April), p. 36.

Boswinkle, E.—The application of a phosphatic fertilizer on different crop rotations in Kenya. *E. Afr. agric. for. J. 26*, 65.

Bullock, J. A.—Greenfly on cereals. *Kenya Farmer* No. 50, p. 41 (August).

Bullock, J. A.—The shiny cereal weevil and legless grub. *Kenya Farmer* No. 49 (July), p. 27.

Clarke, R. T.—A statistical design for a pig feeding trial. *E. Afr. agric. for. J. 26*, 109.

Crowe, T. J., and Glynne-Jones, G. D.—The control of antestia with pyrethrum. *Kenya Coffee 25*, 214.

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Dixon, G. E.—New cereal varieties. *K.I.S. Bulletin No.* 5 (1), February, 1960.

Dixon, G. E.—New cereals, 1960. *Kenya Weekly News*, 12–2–60, p. 65.

Dixon, G. E.—Wheat breeding in Kenya, *Wheat Information Service*, Nos. 9–10, Kyoto, December, 1959.

Dixon, G. E.—A review of wheat breeding in Kenya. *Euphytica* Vol. 9.

Dixon, G. E.—Plant Breeding Notes. *The Kenya Farmer*, No. 44 (February), p. 14, No. 53 (November), p. 33, No. 54 (December), p. 32.

Dougall, H. W.—Average nutritive value of Kenya feeding stuffs for ruminants. *E. Afr. agric. for. J. 26*, 119.

Dougall, H. W. and Bogdan, A. V.—The chemical composition of the grasses of Kenya II, *E. Afr. agric. for. J. 25*, 241.

Dougall, H. W.—The gross energy content of some Kenya feeds. *E. Afr. agri. for. J. 26*, 21.

Dougall, H. W., Glover, J. and Duthie, D. W.—A table of estimates of nutritive values of ruminant feeds. *E. Afr. agric. for. J. 26*, 117.

Dougall, H. W.—Water-soluble phosphorus in some local feeds and faeces. *E. Afr. agric. for. J. 25*, 188.

Evans, H. R. and Blandy, R. V.—Pineapples: notes on cultivation and the economics of production. *Kenya Sisal Bd. Bull.*, No. 34, p. 30 (October).

Evans, T. R.—The development of a sheep industry. *The Kenya Farmer*, No. 48 (June), p. 22.

Goldsack, J. R.—Potato trials. *The Kenya Farmer*, No. 48 (June), p. 21.

Graham, J. F.—Prickly pear: control by an insect. *Kenya Farmer*, No. 46 (April), p. 40.

Graham, J. F. and Hainsworth, E.—Recommendations for seed-dressing. *Kenya Information Services Bulletin*, No. 7 (1), April.

Guthrie, E. J.—Plant Breeding Notes. *The Kenya Farmer*, No. 48 (June), p. 37.

Hainsworth, E. H.—Correct seed dressing routine reduces loss from barley leaf disease. *Field and Farm*, March, 1960, p. 10.

Hainsworth, E.—Flag Smut. *The Kenya Farmer*, No. 48 (June), p. 20.

Hanger, B. F. and Firman, I. D.—Resistant varieties of coffee in relation to physiological races of *Hemileia vastatrix* in Kenya. *Kenya Coffee 25*, 210.

Harrison, M. N.—Plant Breeding notes. *The Kenya Farmer*, No. 43 (January), p. 20.

Henderson, G. R. and Ringrose, M.—Convertible sun/charcoal pyrethrum drier. *The Kenya Farmer*, No. 44 (February), p. 28.

Hughes-Rice, T.—Tea development in Nyanza African areas. *Tea*, Vol. 1, No. 4, p. 27.

Jackson, T. H.—Onions can be profitable as a side line. *Kenya Sisal Bd. Bull.*, No. 33, p. 32.

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Lerche, K.—Planters Day, Mlingano, 1960. *Kenya Sisal Bd. Bull.*, No. 34, p. 13.

Lerche, K.—Some factors in brushroom efficiency. *Kenya Sisal Bd. Bull.*, No. 32, p. 21.

Lerche, K.—Spacing and cutting trials. *Kenya Sisal Bd. Bull.*, No. 34, p. 38 (October).

Melville, A. R.—Plant protection research and its application under the diverse agricultural conditions of Kenya Colony. Paper *in* Report of the 7th Commonwealth Entomological Conference.

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Moberly, P. K.—Rearing Jersey calves: comparison of three methods. *The Kenya Farmer*, No. 45 (March), p. 13.

Moberly, P. K.—Rations for pigs. *The Kenya Farmer*, No. 48 (June), p. 19.

Munro, R. J.—Pyrethrum picking. Booklet published by the Pyrethrum Board of Kenya.

Nattrass, M. S.—The seed testing service. *Field and Farm* (March), 1960, p. 13.

Nottidge, C. P. R.—The best pig breeds for Kenya. *The Kenya Farmer*, No. 43 (January), p. 26.

Nottidge, C. P. R.—The individual feeding of bacon pigs. *The Kenya Farmer*, No. 45 (March), p. 24.

Nottidge, C. P. R. and Betts, R. D. W.—Meat meal in pig rations. *The Kenya Farmer*, No. 43 (January), p. 28.

Poultney, R. G.—The effect of potassium on the productivity of lucerne. *E. Afr. agric. for. J. 25*, 266.

Robinson, J. B. D.—Amber beans. *Kenya Coffee 25*, 91.

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Robinson, J. B. D.—Notes on . . . . diagrams illustrating coffee yields in Kenya (Excluding African . . . .) *Kenya Coffee 25*, 51.

Robinson, J. B. D. and Wallis, J. A. N.—Recommendations for the application of organic mulches in coffee. *Kenya Coffee 25*, 14.

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Thorpe, H. C.—Our yields are not so low (wheat). *Farmer and Planter*, Vol. 4, No. 59, p. 12 (September).

Thorpe, H. C.—Plant Breeding notes. *Kenya Farmer*, No. 46 (April), p. 28, No. 47, p. 26, No. 49, p. 32, No. 50, p. 36, No. 51, p. 28, No. 52, p. 39.

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Thorpe, H. C.—Release of new cereals (1960/61), *K.I.S. Bull.*, No. 14 (November).

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Walsh, N. M.—Some observations on a high intensity storm at Kericho. *Tea. J. Tea Bds. E. Afr.* Vol. 2, No. 1, p. 19.

Wheatley, P. E.—Insect pests in the Coast Province of Kenya. I—Mango. *E. Afr. agric. for. J. 26*, 129.

Wallis, J. A. N.—Grass Control in Kenya Coffee. *Down to Earth, Summer*, 1960.

Legislation

The more important legislative measures enacted during the year were:—

Agriculture Ordinance. Amendment Ordinance (No. 47 of 1960).—The Ordinance makes a number of amendments to the Agriculture Ordinance, 1955, firstly for the purpose of giving effect to the proposals contained in Sessional Papers No. 10 of 1958/59 and 6 of 1959/60, secondly to implement many of the recommendations of the Report of the Committee on the Organization of Agriculture (generally known as the MacGillivray Report) and thirdly to provide the machinery for carrying out the Government's schemes for promoting the settlement and development of land by persons of all races. Opportunity has also been taken to make a few minor amendments which experience has shown to be desirable.

Local Land Development Order.—This Order sets up an Authority known as the Special Crops Development Authority, to prepare and carry out schemes for the development of tea in the non-scheduled (African) areas of the Nyanza, Central and Rift Valley Provinces, subject to the approval of the Director of Agriculture, including the establishment and management of tea nurseries; sale of seed and seedlings to growers; supervision of cultivation; inspection of green leaf; purchase and collection of green leaf from growers and transportation of crops; storage of green leaf. The Authority is also empowered among other things to employ agents to implement such schemes, to receive and control funds, to impose levies on growers, create and operate price stabilization fund, make loans, market green leaf, to enter into agreements with processing factories and to establish its own factories.

Coffee Ordinance (No. 26 of 1960).—This Ordinance consolidates and re-enacts the Coffee Industry Ordinance and Coffee Marketing Ordinance. Membership of both Boards is altered to include Africans who now play an increasingly large part in the industry. No other major changes are made, but the opportunity is taken to recognize the Coffee Conference and to bring the provisions relating to the audit of accounts of the two Boards and the publication of their reports into line with similar provisions in modern Ordinances.

Egerton Agricultural College (Amendment) Ordinance (No. 50 of 1960).—The principal object of the Ordinance is to open the College to students of all races (sections 2 and 3). Section 4 empowers the Governing Body to affiliate the College to or associate it with any university or university system in the Colony or elsewhere. Other minor amendments remedy certain defects and remove unnecessary limitations.

Tea Ordinance (No. 61 of 1960).—Repeals and replaces the Tea Ordinance, 1950, clause 27 of which excluded from the operation of that Ordinance the growing of tea by Africans. In view of increasing co-operation between African and European growers and in the interests of the industry generally, control of the growing and manufacture of tea throughout Kenya and the export of all tea is brought together under one Ordinance. Various other amendments which experience has shown to be desirable are included. The composition of the Tea Board has been altered to make it representative of all tea growers in Kenya, and the terms and conditions of licences and permits, their cancellation, suspension and variation and the refusal to grant licences and permits have been made subject to a right of appeal to the Agricultural Appeals Tribunal.

Agricultural Produce Export Ordinance.—The (Export) (Potato) Rules cover regulations for the export of potatoes, including the issue of export and grading certificates, inspection, grading, packing, fees, etc. The Horticultural Produce Inspection (General) Rules control the export of a long list of horticultural produce laying down rules for packing, condition of produce, inspection and the issue of certificates. Mangoes are the subject of further specific rules under the Grading of Mangoes for Export Rules.

Canning Crops Ordinance.—Imposition of cesses on licensed operators of canning factories in respect of pineapples and on pineapples delivered to licensed operators.

Cereal Producers Ordinance.—Imposition of cess on cereals planted in 1960 and grown in the Scheduled (European) areas.

Crop Production and Livestock Ordinance. Amendment Ordinance (No. 7 of 1960).—Provision is made for the disposal of confiscated crops or livestock.

Sugar Factory Rules.—These rules lay down conditions for the licensing of sugar factories, the payment of fees for such licences, and empower the Minister of Agriculture to refuse the grant or renewal of licences on certain grounds.

Dairy Industry Ordinance.—Imposition of cess on milk produced in the Non-Scheduled Areas; rate of this cess, increase in rate of cess in Scheduled Areas.

Marketing of African Produce Ordinance.—Central Province Collection of Coffee Levy Regulations; amendments to Imposition of Levy Order; tobacco declared a specified crop in certain declared areas of Central Province; South Nyanza Cash Crop Marketing Board set up for the marketing of coffee in South Nyanza District.

Plant Protection Ordinance.—Amendments to Plant Protection (Import Control) Order, principally new schedules. The third schedule lists produce for which an inspector may dispense with inspection and permits if he is satisfied that such items are being imported for consumption, processing, manufacture or any purpose other than propagation.

Wheat Industry Ordinance.—Specification for Lapsi and Urmu. Amendments to Grading of Wheat for Local Purchase Rules.

Staff

Mr. R. J. M. Swynnerton, Director of Agriculture, was appointed Permanent Secretary for Agriculture and Water Resources and Mr. L. H. Brown, Chief Agriculturist, acted as Director of Agriculture from June until October; Mr. A. R. Melville, Chief Research Officer, acted as Director of Agriculture from October until the end of the year and was subsequently confirmed in this appointment.

During the year Dr. P. W. O. Kroll was promoted Senior Research Officer and Mr. J. B. D. Robinson was promoted Principal Scientific Officer. Mr. Robinson later transferred to the Tanganyika Department of Agriculture. Mr. G. H. R. Dew retired in July and Mr. G. Gamble in October. Two Agricultural Officers, Mr. R. J. Jones and Mr. P. G. Dennison resigned.

Five Agricultural Officers completed training in Trinidad and joined the Department in August. They are Messrs. J. R. Goldson, A. W. Allen, D. J. Outram, R. C. Grimes and M. W. Barrett. In addition Miss J. M. S. de Pury was appointed as Agricultural Officer, Education. From within the Department Messrs. P. G. Langrish, R. J. Munro, G. N. Williamson, F. R. P. Bock and E. H. Body were promoted Agricultural Officers on the "A" scale and Messrs. K. Lerche, T. R. Brook, H. J. York, N. G. Glynn, G. E. Goby, M. Sholto Douglas, W. M. Spencer, S. M. Jordon and G. P. Remington were promoted Agricultural Officers (Kenya). In addition, 11 officers were promoted Senior Assistant Agricultural Officers and 28 Assistant Agricultural Officers were appointed during 1960, reducing the vacancies in this grade of post to nine at the end of the year.

The entire staff of the Department has worked under difficult conditions during the year, none more so than our African staff in the field, and the manner in which the standard of the service has been maintained is something of which we can all be very proud.

I would very sincerely thank the staff of the Department for a fine year's work.

A. R. MELVILLE,
Director of Agriculture.

25th March, 1961.

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